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Конференция посвящена обсуждению вопросов развития познавательных процессов, их биологической и социальной детерминированности, моделированию когнитивных функций в системах искусственного интеллекта, разработке философских и методологических аспектов когнитивных наук. В центре дискуссий были проблемы обучения, интеллекта, восприятия, сознания, представления и приобретения знаний, специфики языка как средства познания и коммуникации, мозговых механизмов сложных форм поведения. Специализированные воркшопы были посвящены таким актуальным темам, как активное зрение и коммуникация, работа мозга при патологии, компьютерное моделирование, высшие когнитивные функции животных, процессы речепорождения, нейрокогнитивные механизмы языкового поведения, принятие решений. Материалы представляют собой тезисы лекций, устных и стендовых докладов, а также выступлений на воркшопах. Все тезисы прошли рецензирование и были отобраны в результате конкурсной процедуры. Они публикуются в авторской редакции.

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Лекция Президента МАКИ / IACS Presidential address

STRUCTURE AND DYNAMICS OF INDIVIDUAL EXPERIENCE: MULTIDISCIPLINARY DESCRIPTION

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In his “Rules for the Direction of the Mind” R. Descartes (1629/2011: 23) pointed out the following as the first and main rule: “All sciences are interconnected, so that it is easier to learn all together than each in isolation”. The method of theoretical reduction based on Decartes’ ideas had initially played a positive role in providing interdisciplinary contacts. Later however, along with development of a system alternative to reductionism, exhaustion of this role became obvious. Many now understand that the most important problems of modern science require multidisciplinary approaches, and that reductionism turns into an obstacle in the way of realization of these approaches. Experts in different scientific disciplines, from psychology, biology and genetics to physics and software design, arrive at the conclusion that, although reductionism can be useful for certain purposes, it is no longer sufficient and “as a paradigm, is expired” (A.– L. Barbási 2012, p. 14).

A non-reductionist conceptual bridge between different disciplines can be built on the basis of the theory of functional systems developed by P.K. Anokhin. Informational system mechanisms underlying deployment of organisms’ *functional systems* (FS) can not be reduced to physiological, molecular-biological or psychological processes. These mechanisms operate on every organism’s element involved through the limitation of their degrees of freedom. Such limitations provide complementarity of the whole set of selected degrees of freedom, and thus underlie the achievement of a useful adaptive result by means of mutual cooperation of the elements.

The FS analysis can be used as a tool of multidisciplinary analysis in the following way. Interactions of individuals, including people, with the environment, including cultural environment, can be described as formation of a system *structure of individual experience* (SIE) in the process of learning (systemogenesis) and following realization and reorganization of the SIE. Structure and dynamics of individual experience are considered

with methods and concepts of molecular biology, physiology and neuroscience, psychology, sociology, culturology etc. These methods act as descriptions of different aspects of the united system reality – the SIE. The results of each of these descriptions, for example, physiological and psychological, relate to the other, but not directly, only over the FS description. Thus, the conceptions of FS and SIE appear like a “Rosetta stone” which assists in translation from one discipline language into the language of another, and thus provide the non-reductionist interdisciplinary contact.

The FS analysis as described above has been used in our multidisciplinary studies of structure and dynamics of individual experience. The results of these studies will be discussed in relation to the following problems:

- The SIE formation as deployment of system differentiation, integration and selection on genetic and neural levels. Development as neural specialization during the process of learning (systemogenesis).
- Formation of new FS as simultaneous reorganization (“accomodational re-consolidation”) of the FS formed previously.
- A new system as fixation of a stage of individual development – formation of a new element of individual experience in the process of systemogenesis; the SIE as a fixed history of its formation. Realization of behaviour as, so to say, realization of behaviour formation history (phylo- as well as ontogenetic). Learning the same behaviour during different stages of lifespan as formation of a different SIE.
- Systemogenesis in culture as a process of specialization of individuals and their neurons: cultural and cross-cultural differences of brain structure, psychological characteristics and individual behaviour.
- Consciousness and emotions as characteristics of different simultaneously actualized levels of the systemic organization of behaviour represented as transformed stages of development and corresponding to various levels of system differentiation: the united concept of consciousness and emotions.

- Culture as a structure, represented as a set of elements (systems) and units which symbolize ways of achievement of collective results in a given society at a particular stage of its development. Individual experience and culture as structures with similar characteristics of formation and actualization of elements.

- Emotions and morality as characteristics of low differentiated systems of individual experience and culture.

- Emotional valence as a characteristic of different domains of individual experience (approach vs withdrawal) and peculiarities of these domains' system organisation. Morality and cultural domains (permissible vs forbidden).

- Cross-cultural similarity of moral decisions as an argument for similarity of ancient systems of culture; cultural specificity of moral decisions as an indication of variation of differentiated systems (elements of culture). Dynamics of moral decisions over the stages of individual development as formation of individual morality in this culture.

- De-differentiation of individual experience and cultural structures as regression and archaization.

- Language as an instrument of report to the society about individual (= collective) behavioral results and ontogenetical history of individual

experience formation. Specificity of words used for description of behaviour as a reflection of the degree of differentiation of the FS, actualization of which underlies this behaviour.

- The systems of various levels as consisting of diverse components, in which these components are complementary and mutually *co*-operate for achieving a useful result; their complementarity demonstrated on interneuronal, interindividual and cross-cultural levels.

In the framework of the above stated views, it turns out that psychology, molecular biology, physiology, psychophysiology, sociology, culturology and other disciplines review tendencies characterizing different links and aspects of the uniform cycle: from the SIE to society structure; then through joint activity and achievement of collective results – to cultural structure; and then through a set of genomes and individual genomes to neural specializations, and from these to the SIE.

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Пленарные лекции / Plenary lectures

THE SINGULARITY: A PHILOSOPHICAL ANALYSIS

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The technological «singularity», or I.J. Good's «intelligence explosion», is the rapid transition from greater-than-human artificial intelligence to superintelligence. I will set out and analyze the

argument for an intelligence explosion, and will consider the forms that such an explosion might take. I will also consider resulting practical and philosophical issues. If a singularity is likely, what are the best strategies for ensuring a good outcome? Will systems in a post-singularity world be conscious? Can we be among them?

COEVOLUTION, DEVOLUTION, AND LANGUAGE

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Why has the study of language origins seemed so nearly intractable? I think that part of the answer is that we persist in assuming it must have arisen only by the actions of natural selection (or mutational miracle) and/or cultural convention. This either/or dichotomy ignores a number of critical factors, even when it is assumed that both play a role. I argue that many of the most significant factors arise neither from nature nor nurture.

Two under-appreciated evolutionary processes (1 & 2) need to be introduced to provide a complete understanding of the factors contributing to the human language capacity.

1. Symbolic niche construction effects: Language and brain co-evolved; i.e. language structures adapt (over thousands of years) to

human neurological constraints and brains adapt (over hundreds of thousands of years) to the peculiar demands of symbolic communication. This means that human brains have become adapted to function well in a novel artificial symbolic niche rather than merely in a social-biological ecology.

2. Exaptation effects due to relaxed selection: The recruitment of old brain structures to handle the new demands of language was made possible due to the relaxation of selection pressures, which allowed novel synergistic functional relationships to develop between brain structures that were previously functionally independent.

Ignoring these influences is responsible for much of the controversy and mystery that has surrounded the discussion of the distinctiveness of the human language adaptation and the remarkable parallelisms of language structure worldwide.

PROPERTIES OF CONSCIOUS EXPERIENCE: ANOTHER STRANGE INVERSION

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Do we «project» subjective properties of our experience into the outer world? This has been a very tempting metaphor for hundreds of years. The attempt to explain the apparent features of conscious experience in materialistic terms requires theorists to adopt an instance of Darwin's «strange inversion of reasoning» (Dennett, PNAS, 2009) supplemented by Hume's ideas about our experience of causation.

This opens the door to a Bayesian theory of the content of conscious experience, finding a literal meaning for the metaphor of projection, and shows what is confused in the accounts of «phenomenal consciousness» proposed by Block and Lamme.

SYNTACTIC COMPLEXITY: A DEVELOPMENTAL PERSPECTIVE

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Complexity is defined, following Simon (1962), as a property of **organized systems** whereby parts and sub-parts are nested in a **hierarchical structure** of nodes and connections. Increased complexity is thus an increase in the number of hierarchic levels within the system. In syntax, hierarchic structure begins at the simple clause level, continues with **clause chaining** (conjunction), and is most conspicuous with clausal embedding, labeled by some as “recursivity” (Hauser et al. 2002). The most common types of **clausal embedding** are **relative clauses**, embedded in the noun phrase, and **verbal complements**, embedded in the verb phrase.

Like everything else in language, syntactic complexity is the product of three developmental processes – **phylogeny** (evolution), **ontogeny** (child development), and most directly **diachrony** (adult behavioral change). In particular, it is diachrony that is directly responsible for cross-language **typological diversity**.

In this paper I will follow loosely the treatment offered in Givón (2009), beginning with the biological foundations that underlie the genesis of human language, and thus of syntactic complexity.

I will suggest that increased complexity, whether in ontogeny, phylogeny or diachrony, is a **combinatorial** process, joining parts that earlier fell under separate intonation contours into **complex constructions** that fall under a **single intonation contour**. Complex syntax is thus built up progressively from **parataxis to syntaxis**.

To illustrate the genesis of complex syntax, I will then discuss one detailed example, the diachronic rise of **relative clauses**. I will show that (a) all major types of REL-clauses arise from various paratactic source constructions; (b) that all of them arise under the same adaptive – communicative – pressure; that (c) all of them follow the general pattern of parataxis-to-syntaxis; and (d) that the morpho-syntactic structure of the various types of REL-clauses is largely predictable from the structure of their source constructions. Lastly, I will discuss the systematic similarities between **language diachrony** and **biological evolution**, suggesting that cultural transmission can and should be viewed within its bio-evolutionary context.

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SOCIAL COMPLEXITY: CAN IT BE ANALYSED AND MODELLED?

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Abstract

Over the past decade or so Network Theory has turned out to be a powerful methodology to investigate complex systems of various sorts. Through data analysis, modelling, and simulation quite an unparalleled insight into their structure, function, and response can be obtained. In human societies individuals are linked through social interactions, which today are increasingly mediated electronically by modern Information Communication Technology thus leaving “footprints” of human behaviour as digital records. For these datasets the network theory approach is a natural one as we have demonstrated by analysing the dataset of multi-million user mobile

phone communication-logs. This social network turned out to be modular in structure showing communities where individuals are connected with stronger ties and between communities with weaker ties. Also the network topology and the weighted links for pairs of individuals turned out to be related. These empirical findings inspired us to take the next step in network theory, by developing a simple network model based on basic network sociology mechanisms to get friends, to catch some salient features of meso-scale community and macro-scale topology formation. Our model turned out to produce many empirically observed features of large-scale social networks. In addition to the above described structural analysis of human social networks we have also looked at the dynamics of social interaction by including into the data analysis demographic data, i.e. gender and age information of the individual mobile phone communication service subscriber. In this way we

are able to look at the patterns of social behaviour and changes therein for individuals of different gender and age. In summary we believe that the network theory approach combining data analysis with modeling and simulation could open up a new

and quantitative perspective for studying and even predicting various collective social phenomena such as information spreading, formation of societal structures, and evolutionary processes in them.

CONTEXT AND REPRESENTATIONS IN ACTIVITY: INSTALLATION THEORY

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Distributed cognition (Hutchins, 1995) shows how cognitive processes involve both internal (inside the body) and external input (from the context), which are integrated by the subject as it performs its activity. Therefore, as context plays its part, the subject does not need to embody *all* the components of the activity, just as an actor only needs to know its own part in a play, and some reminders from the other actors' utterances. This *scaffolding by the context* in real activity explains why it is so difficult to get realistic accounts from subjects outside of context – a major limitation of classic psychological techniques.

To go beyond this limitation, we developed a new technique where we use two streams of data: a) recording of actual situated activity (obtained through a miniature videocamera – “subcam” – worn at eye-level by subjects as they perform naturally) and b) recording of contextualized explanations by the subjects as they watch their own subcam tapes (a process in which they access episodic memory (Tulving, 2002) and exhibit remarkable remembrance of cognitive states (Lahlou, 2011). This enables “peeling off” in great detail the various components of a given activity, and checking validity of interpretations with the subjects themselves.

Our analyses led us to propose a simplistic but handy model to describe the various components which influence activity: affordances of the context

(Gibson, 1982); subject's representations and other embodied skills; control by social institutions. These different components are studied by different disciplines and so the formalisms and scale of their models differ; therefore it is easier to take them into account as separate layers to study a given activity. Our crude model (“installation theory”) considers that culture creates local *installations* combining these three layers to nudge and scaffold human activity.

The three layers undergo an intertwined construction and evolution, where social representations (Moscovici, 2008) play a crucial role.

I shall describe the evolutionary logics of this installation as *a dual adaptive selection between representations and objects, monitored by institutions*. This clarifies the concrete mechanisms of social construction (Berger & Luckmann, 1967) but also of social representations themselves.

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Устные и стендовые доклады / Spoken and poster papers

NEUROPHYSIOLOGICAL EVIDENCE THAT MILD HYPOXIA PATIENTS HAVE SELECTIVE RECOLLECTION IMPAIRMENTS BUT INTACT FAMILIARITY

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In several previous behavioral studies we have identified a group of amnesic patients that exhibit selective deficits in recollection with preserved familiarity-based recognition. However, these studies have relied exclusively on behavioral measures, rather than direct physiological measures. To further examine recollection and familiarity processes in these patients, we recorded ERPs in three amnesic patients and six age matched controls while they made item recognition and

source recognition judgments. ERP studies of recognition in healthy subjects have indicated that recollection and familiarity are related to a late positive component (LPC) and an earlier frontal component (FN400), respectively. The current patients were able to discriminate between old and new items fairly well, but were near chance level performance at making source judgments. Moreover, whereas control subjects exhibited ERP correlates of recollection and familiarity, the patients only exhibited a familiarity correlate. The results show that recollection can be selectively impaired in amnesia, with relative sparing of familiarity-related processes.

EXPERIMENTAL AND CORPUS EVIDENCE FOR PROTOTYPICALITY EFFECTS IN COLOR TERMS

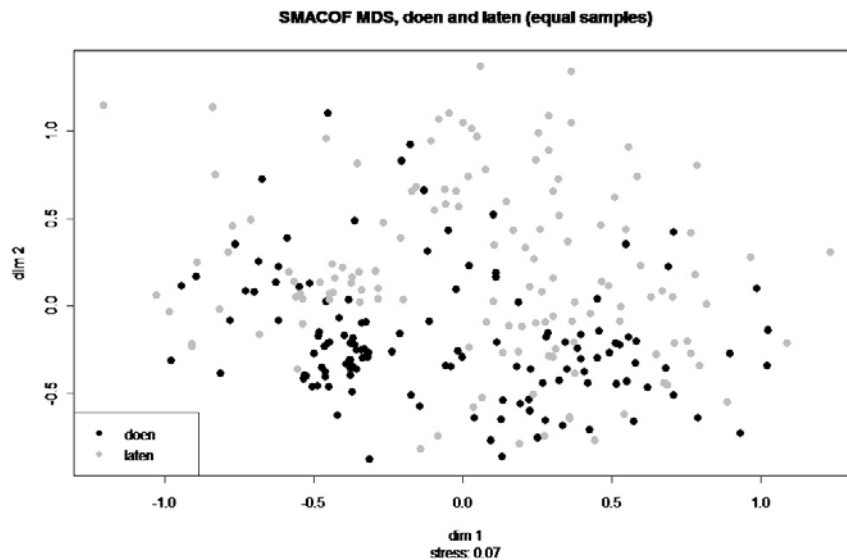
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Color categorization research has traditionally developed as a very multidisciplinary field spanning the widest range of disciplines from physics, neurophysiology and psychology to anthropology, linguistics, history of arts and graphic design. This diversity of methodological and theoretical



perspectives has provided important insights into the multiple factors that shape the cognitive processes underlying color categorization in different contexts.

The present paper brings together two methodological frameworks in the study of color term salience – the experimental studies of basic color terms in Berlin and Kay tradition and a linguistic corpus-driven analysis of prototypicality effects in lexical units. The experimental approach has developed a number of behavioral experimental procedures for measuring the salience (basicness) of color terms based on the neurophysiological constraints and the structure of the perceptual color space (see, for instance, Berlin and Kay 1969, Rosch Heider 1972, MacLaury 1997). Many of these techniques have been successfully applied to other semantic domains in search of prototype representations. However, in the color domain itself the discussed measurements have been mostly limited in their application to basic color term analyses.

Alternatively, the recent linguistic corpus-based studies of color terms demonstrate that color term salience is a matter of degree and cannot be reduced to the dichotomy of basic vs non-basic color terms (Kerttula 2002) and that it might be affected by contextual factors (Steinvall 2002). These findings give evidence to an internal hierarchy and graded membership in color categories in line with the multivariate model of semantics developed in Cognitive Linguistics. They might also suggest the heterogeneous nature of salience that includes linguistic, categorical, and cultural levels (Geeraerts et al. 1994, Geeraerts 2006).

In this study, we aim to develop a rigorous quantitative method to measure the prototypicality effects in the semantics of lexical units, using color

terminology in American advertising as the source of data. We approach this goal from two perspectives. Firstly, we analyze the psycholinguistic techniques developed in basic color categorization studies for measuring salience (basicness) of color terms and compare them to corpus-derived measurements of color term salience. Secondly, we analyze a number of color terms using a bottom-up quantitative procedure for measuring their relative salience based on linguistic properties. Following the usage-based approach to semantics, we specifically avoid the *a priori* distinction between more prototypical (basic) and less prototypical (non-basic) color terms.

The study is based on an extensive self-compiled multimodal database of color names and color samples from web-sites used by US manufacturers and retailers for online marketing in four product categories (automobiles, clothing, make-up, and house paints). For the purposes of the presented analyses, we randomly selected a sample of 16400 observations equally representing the four product categories.

In the first part of the study, we explored the correlation between the linguistic corpus-derived parameters of salience such as the length of the color term, morphological productivity, preference for the head or modifier position etc. and the behavioral measurements of salience developed in psycholinguistic experiments such as reaction time and consistency of naming, frequency and ranking in elicitation tasks (Boynton and Olson 1990, Corbett and Davies 1997, Taft and Sivik 1997, Sturges and Whitfield 1997). The analysis was based on Kendall tau rank correlation coefficient and hierarchical cluster analysis using the data available for 34 color categories. The results allowed us to identify several groups of salience parameters and

suggested the general convergence of experimental and corpus evidence.

In the second part of the study, we used corpus-derived parameters to explore the relative salience of over 200 most frequent color terms used in advertising. The results based on Kruskal's non-metric multidimensional scaling analyses confirm that basicness or salience of color terms is a continuous non-homogeneous parameter rather than a dichotomy. We can observe a continuum from the traditionally recognized BCT (*green, blue, red*) followed by the so-called secondary BCT (*orange, purple, pink*) through well entrenched non-basic monolexemic names (*wine, burgundy, charcoal*) to compounds with color modifiers (*light blue*) and finally to the most idiosyncratic compound terms (*deep sea blue, titanium silver*). It is especially notable that certain non-basic color terms (*navy, tan, beige*) are very close in their salience to basic color terms. The analysis also suggests the significant role of the different product domains in the salience of specific color terms.

Using the convergent evidence from psycholinguistic and corpus-based measurements, we argue that a number of techniques developed in corpus-driven studies of linguistic variation could be added to the arsenal of measurements applied in the basic color term tradition. This would allow including linguistic and sociolectal factors in the multivariate account of color categorization and developing generalizations on a larger scale than

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COGNIZING AGENTS FOR A BETTER UNDERSTANDING OF COGNITION

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Understanding cognition and modelling, designing and building artificial cognitive systems are challenging and long-term research problems. Here we show how cognition can be understood better by a well-founded integrated theory and how can be it modelled as a cognizing agent.

Cognising agent (Anshakov and Gergely 2010) means either a living entity (particularly a human being), or a group of them or a technical system, which can adapt to the changing conditions of the external environment. In the adaptation process a cognizing agent perceives information (data) about the environment and generates reactions.

Learning and reasoning are important constituents of information processing that provide the ability to reduce uncertainty and to move from ignorance to knowledge. This is connected with information extraction from the initially available data and facts. For this information and knowledge extraction appropriate initial data are needed, which can be collected from different sources: (i) from observation and experimentation, (ii) from processing the available knowledge, (iii) from external information and knowledge bases, and (iv) from model experimentation based on the available knowledge.

The extraction may result in new information which can then be used to augment the knowledge either about the environment by improving the model about it or about a problem domain. A cognizing agent can use the improved model for a better understanding of how things might possibly be, not only now but at some future time, and to

take this into consideration when determining how to act in the environment. Therefore cognitive reasoning provides the possibility of predictive activity for a cognizing agent beyond the usual reactive activity. Therefore cognition breaks free of the present in a way that allows a cognizing agent to act effectively, to adapt and to improve. For this, information processing is strongly intertwined with knowledge. However, a cognizing agent would not only need to reason with knowledge, but would also be required to remember its experiences and recall them exactly when needed as well as learning from them. Therefore, a cognizing agent is capable of (i) recognizing the world in which it exists, (ii) acquiring, storing, maintaining and enhancing its knowledge in order to learn about its environment and/or solve problems and (iii) reflecting on its own knowledge and processes. Thus the basic capacities of cognitive systems are learning, reasoning, knowledge management and self-reflection. From these components the system synthesises its cognitive processes, such as perception, cognitive learning and problem solving.

The developed well-founded integrated theory which permits to develop a cognizing agent with the above properties provides the so called cognitive reasoning framework (CRF) that can support:

- The description of the observed events and objects (descriptive language)
- The description and representation of the cognizing agent's knowledge (subjective knowledge)
- The description and representation of the knowledge about a given environment and about the corresponding subject domain (objective knowledge)
- The representation of cognitive processes from observation to subjective knowledge and from subjective knowledge to objective knowledge
- The construction, representation and implementation of the cognitive reasoning strategies of the cognitive reasoning processes

For the representation of the processes that are taking place in the "brain" of the cognizing agent we suggest the use of a CR framework which will support two classes of theories: (i) the open cognitive or quasi-axiomatic theories and (ii) the modification theories.

A theory is called open because it is open for the representation of the interaction between the cognizing agent and its environment. It should be open for (i) obtaining new facts for analysis, (ii) adopting and internalising knowledge from other similar theories and (iii) modification of the reasoning rules. An open cognitive theory is

used to represent the activity of a cognizing agent as a history. Thus an open cognitive theory is an essential component of self-reflection of an agent.

The information processing activity of a cognizing agent is represented in the form of several embedded cycles. The internal cycle consists of iterative reasoning algorithms repeated until the completion condition is met. This cycle is modelled by the use of a modification theory. The external cycle represents repetition of perception and reasoning phases and proceeds from the beginning to the end of the activity of the cognizing agent. The external cycle is modelled by the use of an open cognitive theory.

CRF will also permit the use of models for experimentation and accepts the data so obtained as being about the external world (environment). The results of experiments will be represented as observational sentences, i.e., as facts. Thus a cognizing agent may generate its own hypothetical inputs, as in the case of modification rules, e.g. in the case of abduction, induction or theory formation. The formal CR framework will provide formal tools to handle (i) the dynamic nature of cognitive reasoning; (ii) the "semantic" or "content" aspects of reasoning; and (iii) indeterminacy and temporal contradictions of the reasoning processes.

Generally speaking, we represent a cognizing agent as a researcher, not as a hunter or a soldier. It is not the speed of reaction, but the completeness, validity and depth of the knowledge that will be the criteria of success of such an agent. Therefore it is quite justified for such a cognizing agent to act thoroughly, systematically and even slowly. The discreteness of the activity of this agent manifests itself in the fact that first of all it accumulates information and only after that analyses it and forms new knowledge using all data available to the analysis.

The basic restrictions to our model of the cognizing agent are as follows:

- For knowledge extraction a cognizing agent uses reasoning in a broad sense, which may include deductive inference, plausible argumentation and computing procedures;
- Activity of a cognizing agent is discrete; it consists of alternating phases of perception of the environment and reasoning directed at formation of new knowledge;
- In the course of functioning of the cognizing agent a history of its cognizing activity is formed.

Our model distinguishes two modes (or phases) of operation of the cognizing agent:

- The mode of interiorisation of the perception
- The mode of cognitive reasoning.

The main task of the interiorisation phase of perception is updating (retuning) of the reasoning unit. This updating can affect all the components of this unit. The basic action of the interiorisation phase of perception is conversion of data and knowledge into an internal representation (format) of the cognizing agent.

We will also develop the architecture of the cognizing agent which can realise the proposed solution.

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ARE ANXIOUS INDIVIDUALS AFRAID OF NEUTRAL PICTURES? EVIDENCE FROM THE ANTI-SACCADDE PARADIGM

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Introduction

Several theories have been proposed to explain the detrimental impact of anxiety on cognitive performance. The most recent theory suggests that anxiety disrupts two key executive functions: shifting and inhibition (Eysenck et al. 2007, Derakshan & Eysenck 2009). Other theories postulate the existence of threat-related attentional biases (Cisler & Koster, 2010). These biases toward threat-related stimuli have been observed in a number of studies. Adverse effect of negative emotional stimuli on cognitive performance is a robust phenomenon, but still it is not clear if neutral stimuli can also produce similar effect. Some studies suggest that individuals with high trait anxiety display attentional bias not only toward negative emotional stimuli, but also toward neutral social stimuli (neutral faces) (Wieser 2009).

Aim of the study

The authors of this study aimed to examine the role of different types of neutral stimuli (social vs nonsocial) to investigate whether individuals with high trait anxiety display attentional control deficits, compared with individuals with low trait anxiety.

Method

In order to assess the impact of anxiety on cognitive performance in individuals varying in the level of trait anxiety, a modified antisaccade task was used. The antisaccade task is a well-established paradigm used to assess the inhibition function (Hallet, 1978). The task consist of two conditions: in the first one subjects are required to look in the direction of a cue that appears on the screen. Subsequently to the cue (exactly in the same location) the target appears. To achieve high accuracy in this condition, subjects have to automatically follow the cue. In the second condition („antisaccade condition”) subjects are required to

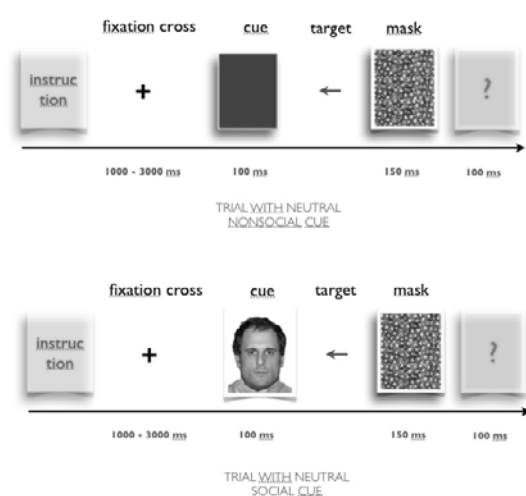


Figure 1. The experimental design.

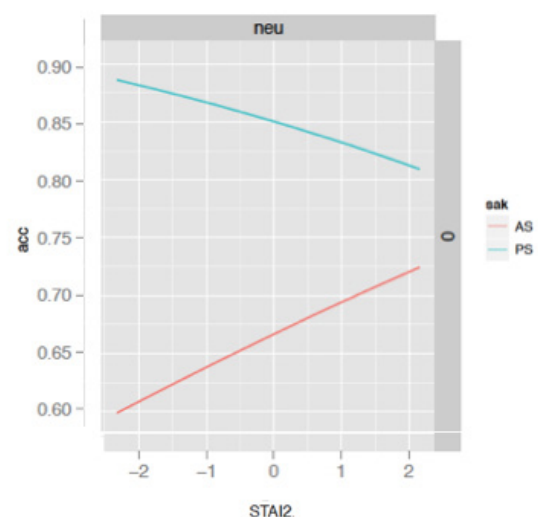


Figure 2. The accuracy of performance (on Y axis) in prosaccade condition (PS - the upper line) and antisaccade condition (AS - the lower line). The X axis depicts the trait-anxiety level.

stop an automatic reaction of following the cue and engage attentional control to direct their gaze to the opposite side of the visual field.

Two types of neutral stimuli (social vs nonsocial) were used in the study. Social cues (neutral faces) were taken from the NimStim Face Stimulus Set (<http://www.macbrain.org>). To measure the trait anxiety the STAI2 Inventory was used (Spielberger, Gorsuch & Lushene 1983).

According to the attentional control theory (Eysenck et al. 2007) the authors expected that subjects with high level of trait anxiety (Spielberger, Gorsuch & Lushene 1983) would achieve lower accuracy of performance in the condition that requires attentional control („antisaccade condition”), while they would achieve higher accuracy of performance in the condition that requires only automatic reaction („prosaccade condition”).

Results

In order to analyze the data, the mixed model was implemented. The analysis revealed that the higher the trait anxiety level in the prosaccade condition, the lower accuracy for neutral cues. In the antisaccade condition we found that higher trait anxiety level was accompanied by higher accuracy for neutral stimuli. The authors replicated the results using two different types of neutral stimuli – social and nonsocial.

Conclusions

These results do not support the attentional control theory, suggesting that trait anxiety could

affect the attentional control only under certain conditions. We claim that attentional control theory, although generally accepted, is too specific to explain all the anxiety-related cognitive problems. At the moment the authors are trying find a new framework that would allow them to explain these findings.

Future studies

The authors aim to conduct further research with other types of cues, and with the use of eye-tracking tools that would provide more precise measure of attentional control.

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LEARNING AND PERFORMING THE TASK WITH CLOSED AND OPEN EYES IN RATS AND HUMANS

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Organisms have specific abilities allowing them to use different parameters of the environment for satisfying their needs and achieving adaptive outcomes. Vision, as one of these abilities, provides the faculty for using certain optic parameters of the environment in new experience acquisition and behaviour organization. If vision is limited, organisms are still often capable of satisfying their needs and achieving necessary outcomes. However, learning and behaviour are usually complicated without vision. This work is focused on studying how individuals with an intact visual system and normal visual development deal with a familiar task and learn a new task in the absence of visual contact

with the environment. As ecological significance of vision varies among species, one of the questions we put here was: can any specificity be observed in behavioural dynamics of learning without vision by humans, who use vision widely, as opposed to rats, whose need for vision in solving their evolutionary problems is not so crucial as for other senses?

We used two experimental models of cyclic behaviour; one for rats (Experiment 1) and one for humans (Experiment 2). In both models, Group 1 had to learn the task with closed eyes and Group 2 with open eyes. After the task had been acquired, its performance was studied in three experimental stages, or conditions. For Group 1, the sequence of stages was closed-open-closed eyes, and for Group 2, open-closed-open eyes. Mann-Whitney U Test was used to compare samples and Wilcoxon match

pairs test was used to compare between stages within the same sample, significance level $p < 0.05$.

In **Experiment 1** two groups of rats ($n=27$) learnt an instrumental lever-press task in an operant chamber without guiding by an experimenter. Rats from Group 1 were placed into the chamber with eyes covered by light-proof spectacles. They had not seen this chamber before so they could not use optic parameters of this environment to learn the task. Light-proof spectacles were used only in the chamber (30 min per day). Rats from Group 2 could see the chamber during learning. We recorded visual EP to control the quality of the eye covering and EEG during the instrumental behavior performance over the motor, retrosplenial and visual cortices.

In **Experiment 2** human participants ($n=16$) learnt a spatial task which was presented as a game. During this game participants could learn to collect and accumulate points navigating with their fingers around a playing field. The playing field was composed of certain size squared black keys. Every key press was accompanied with a sound. Navigating around the playing field according to the sound feedback, subjects found a sequence of moves which brought them points. Thus, to accumulate points they had to repeat this sequence of moves. Similar to Experiment 1, participants comprised two groups: Group 1 learnt the task

wearing a blindfold and Group 2 learnt the task with open eyes.

These experiments showed that in neither rats nor humans the absence of visual contact with the environment affected the time required to learn the tasks. After training, both humans and rats with open eyes performed the task faster compared to those with closed eyes. The dynamics of the task performance with closed and open eyes in the three experimental stages depended on the learning conditions (see Fig 1). As it could be predicted, the speed of the task performance displayed by rats and human participants from Group 2 decreased when they had their eyes closed during the second stage and then increased again when they had open eyes during the third stage (Fig.1 B, D). Participants from Group 1 showed the opposite dynamics, they performed the task slower with closed eyes during the first experimental stage, faster with open eyes during the second stage and slower again during the third stage (Fig.1 C). Unlike humans, the only difference in the task performance found in rats from Group 1 was between the first and second experimental stages (Fig.1A); their performance could be described as more stable.

Interestingly, human participants from both groups increased the speed of the task performance during the third stage of the experiment compared to the first stage (Fig.1 C, D), and this phenomenon

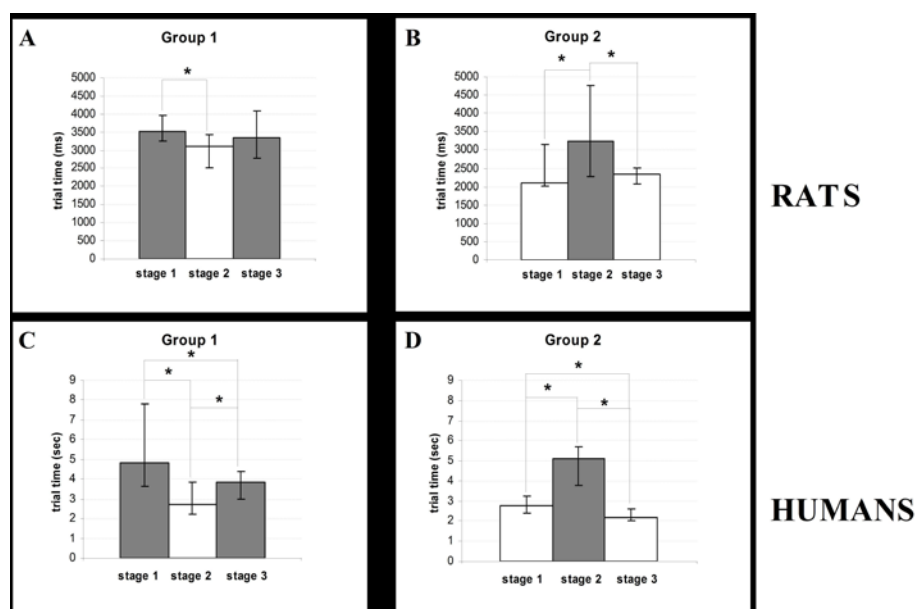


Fig.1. Task performance in three experimental stages by rats (A, B) and humans (C, D). Group 1 initially learnt the task with closed eyes and Group 2 learnt the task with open eyes. Dark bars indicate experimental stage, or condition, with closed eyes, light bars – open eyes. The sequence of the experimental stages for Group 1 was closed-open-closed eyes, and the sequence for Group 2 was open-closed-open. Wilcoxon match pairs test was used, $p < 0.05$.

was not observed in rats (Fig. 1 A, B). This dynamics might be explained as a simple result of learning, but also it could reflect the effects of specific experience of the task performance in different conditions formed during the second experimental stage and general ecological importance of visual experience for humans. To test this possibility it is necessary to increase the samples and study control groups. These two requirements are currently in the process of answering.

Thus, it has been shown that individuals could learn a new task successfully regardless of whether they had visual contact with the environment or not, and this was the case for both rats and humans, whose visual abilities and ecological importance of vision are different. However, the dynamics of the task performance with closed and open eyes was different in individuals trained without vision compared to those who were free to use

it; and this dynamics was specific for rats and for humans. These results could indicate that even if optic parameters of the environment are not so crucial to learn a task successfully, they can still be an important part of formation and realization of inward individual experience; and as visual abilities and their significance are higher in humans, their individual experience may be more affected by the absence of visual contact with the environment. The further analysis of learning and behaviour (such as trajectories of moves) as well as studying brain activity in these tasks may assist in a deeper understanding of the role of visual contact with the environment in formation and realization of individual experience.

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NARRATIVE PRODUCTION IN LITHUANIAN PRESCHOOLERS AND SCHOOL-AGE CHILDREN

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During the last decades, school-ages' literacy and general language development seems to become one of the most problematic areas. In Lithuania, as well as in other countries (Gardner et al. 2006, Topaj and Gagarina 2009), speech therapists, psychologists and teachers observe an increasing number of children with language disorders (SLI, dyslexia, etc.) or delay who need a speech therapy and/ or a help of so called special pedagogues. Although we still need a comprehensive statistic data about Lithuanian language impairments, one can observe that impaired phonology, grammar and narrative skills tend to complicate a whole process of learning (not languages only, but also other subjects), lead to low academic results and cause a learning demotivation. Thus Lithuanian language and literacy development has to be investigated in order to a) indicate typical development of Lithuanian spoken and written language, and b) to identify children, whose language may probably be impaired.

This paper deals with narrative discourse which is considered one of the most informative methods and/or tools for general language screening and assessment. The study was carried out in the framework of a national

scientific project *Lietuvių vaikų kalba: įtakos ir tendencijos*¹. The analysis is based on an experimental data of 72 Lithuanian typically developing monolingual children (6–11 years age) from middle class families, attending state kindergartens/ schools in Kaunas (Lithuania).

During the investigation, the children were tested individually; they were asked to tell a story according the *Cat Story* (Hickmann 1982) and the *Fox Story* (Gülzov and Gagarina 2007) picture sequences. The stories were recorded, transcribed and annotated for an automatic analysis using CHILDES (*Child Language Data Exchange System*, MacWhinney 2010) tools. During the analysis, a microstructure (syntactic complexity, lexical diversity, and general productivity) and a macrostructure (narrative structure, quantity of information, and coherence of text) of the stories were investigated².

¹ Project “*Lietuvių vaikų kalba: įtakos ir tendencijos*” [*Lithuanian children language: influences and tendencies*] was coordinated by Vytautas Magnus University (Kaunas) and supported by a grant No. LIT-1–18 from the Research Council of Lithuania.

² The study was based on a methodology developed during author's PostDoc studies (supported by a grant No. SF-PD-2010–08–10–0199 from the Research Council of Lithuania. I would like to express my deep gratitude to Prof. Dr. I. Dabašinskienė and Dr. N. Gagarina for their helpful comments on the methodology and interpretation of the results.

The results lead to a general conclusion, that narrative production skills are completely (or almost) acquired already at the preschool age. With a few exceptions, general productivity (MLUw and type/ token ratio) indexes were quite high, and semantic analysis indicated a wide-ranging lexical diversity. The children also demonstrated correct narrative structure, sufficient quantity of information and managed to express the main idea correctly. However, complex syntactic structures (especially causal and temporal clauses) were still difficult to produce even at 11 years age, but these skills also seem to be partially acquired.

WHAT IS NORMAL WHEN WE ARE IMPAIRED: COGNITIVE EFFECTS IN PROCESSING SPACE

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This paper is part of a broader interdisciplinary linguistic and neuropsychological study of space in aphasic individuals with different types of aphasia. It is aimed at experimental testing of the so-called 'space factor' (Luria 1969). One of the series of experiments included in this research program is presented in this paper.

In studying spatial impairments in language and cognition one has to structure experimental material and conditions along several lines: language as opposed to other cognitive functions (processing of visual stimuli), various linguistic constructions employing the concept of space (prepositional, instrumental, parametrical, temporal et al.), differences across various aphasia types (motor, sensor, or semantic aphasia). It allows for the diversity of experimental designs to be used as parts of the whole experimental study.

Some of these conditions were met in previous studies of Russian speakers by the same group of authors. In the test that included both linguistic (sentences) and corresponding visual (pictures)

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material, five main types of the reversible logical-grammatical constructions were tested in healthy speakers: prepositional (*The boy puts the box into the bag*), comparative (*The tree is higher than the house*), parametrical (*The pilot of the plane is burning*), instrumental (*The old woman is covering the hat with the scarf*) and temporal (*The boy eats before he goes to bed*). In reversible constructions, situational pragmatics doesn't help and only grammatical markers are a reliable source for interpreting relationships between the two objects. It was demonstrated that irreversible constructions are estimated significantly more acceptable than reversible. It can be explained by *pragmatic accessibility* of sentences, which removes ambiguity. Secondly, it was found, that some types of constructions are more ontologically accessible, because they describe observable real-world every-day situations. These constructions (prepositional, instrumental and temporal) are estimated significantly more acceptable than constructions, which are based on the abstract metaphors of location and movement (comparative and parametrical).

The current experiment focused on one type of constructions in the language-specific modality across the three aphasia types as compared with healthy speakers. The constructions involved were prepositional sentences which served as the prototypical constructions expressing space concepts in the language.

Linguistic variability of 'space' across languages is very high. Based on force dynamics theory by Talmy (1985) and Langacker (1999) it sets Location in its two aspects – Orientation and Motion – as two fundamental concepts coded in languages. In studying orientation and motion

cross-linguistically, prepositional constructions turn out to be the crossing-point of various oppositions (in form and in meaning) such as figure, ground, path, manner, cause, adpositions, verbal and noun forms, systems of coordinates jammed and conflated in the most basic structures employed by a given language. Secondly, prepositional constructions express orientation and motion both prototypically as physical location and/or movement of the human body or other physically observed objects, and metaphorically.

The experiment involved 48 prepositional constructions (both reversible and irreversible) describing location in the physical (non-metaphorical) world and paraphrases representing conventional implicatures of the mental picture created by these sentences. Three groups of aphasic individuals diagnosed with motor, sensor/acoustic-mnestic, and semantic aphasia plus a control group of healthy speakers were separately tested. Participants had to choose one of the two paraphrases to the targeted sentence (e.g., sentence *The boy is putting the bag into the bucket*, paraphrases *The bag is hardly visible* or *The bucket is hardly visible*). The accuracy and the time of reaction were measured.

The results revealed significant difference in the accuracy and time of reaction in all groups of participants for the reversibility factor. Even healthy participants made more mistakes in reversible constructions. Critically, the reversibility factor interacted with the group factor for healthy individuals and patients with semantic aphasia: in irreversible sentences they made comparable number of mistakes (99% correct in the healthy group and 93% correct in the semantic aphasia group), but individuals with semantic aphasia demonstrated specific decay in interpretation of the reversible constructions within the range of chance level (64% as compared to 88% in the healthy

group). Reversibility factor did not interact with the group factor for the healthy vs individuals with sensor/acoustic mnestic aphasia (64%, 80%) and healthy vs individuals with motor aphasia (66%, 77%). Both sensor/acoustic mnestic and motor groups didn't show a specific spatial disorder, but demonstrated general decay in processing prepositional constructions.

Summing up the accuracy results, individuals with sensor/acoustic mnestic and motor aphasia make more mistakes in reversible than in irreversible constructions, BUT in the same proportion as healthy speakers. They generally make more mistakes. Semantic aphasia patients have a specific spatial disorder as demonstrated by reversible constructions, BUT they don't differ from the healthy speakers when dealing with irreversible ones.

Our data support Luria's thesis about specific disorder in interpretation of space in reversible (not supported pragmatically) constructions by patients with semantic aphasia and refute the thesis by Goodglass (1993) that reversible constructions are non-specifically impaired in all aphasia types. Importantly, the current experiment provided strong support for the normal pattern of processing reversible and irreversible prepositional constructions in motor and sensor/acoustic-mnestic aphasia, the general decay of their linguistic processing being taken into account.

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HOW THE BRAIN PROCESSES PRESENT TENSE VERBS THAT REFER TO THE PAST

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Introduction

Agrammatic aphasia is a language disorder due to brain damage, in which grammar is particularly

impaired. A core issue in neurolinguistic research is to what extent the language problems that aphasic patients suffer are exclusive for their brain damage. Possibly, the processes that are vulnerable in aphasia also require more cognitive resources for the healthy brain. A way to tap into unimpaired language processing is to study event-related potentials (ERPs) registered at the scalp. ERPs are brain responses that can be related to

different levels of linguistic processing, including grammar.

Results from several structurally different languages demonstrated that agrammatic aphasic patients find it more difficult to produce and comprehend verb forms that refer to the past than verb forms that refer to the present, captured in the Past DIscourse LInking Hypothesis (PADILIH; Bastiaanse et al., 2011). The PADILIH holds that verb forms referring to the past, such as ‘*wrote*’, are impaired in agrammatic aphasia, because they are discourse linked: in order to interpret the past tense, an additional link has to be made to some other event time in the discourse. Verb forms referring to the present, such as ‘*writes*’, are relatively spared, because they are locally bound: no additional discourse-link is needed because the event time the verb refers to is in the here-and-now of the moment of speaking. The PADILIH is based on two assumptions: (1) Present Tense is locally bound within the sentence and Past Tense is discourse linked (Zagona, 2003) and (2) Discourse linking is impaired in agrammatic aphasia, whereas local binding is intact (Avrutin, 2000).

Differences in past and present time reference can also be found in non-brain-damaged individuals. In Dutch, Dragoy et al. (2012) showed that violations of a past time reference context by Present Tense such as in ‘*The waiter who before *grinds the pepper doesn’t get a tip*’ evoked a P600 ERP effect. The P600 is a positive wave around 600 ms after the violation, evoked by grammar-related difficulties (Coulson et al., 1998). However, no such effect was found for a violation of a present time reference context by Past Tense, such as in ‘*The waiter who now *ground the pepper doesn’t get a tip*’. A delayed effect appeared only after all relevant discourse information had come in. This means that both violations have been noticed, but violations by Present Tense are treated as locally ungrammatical, while violations by Past Tense – as discourse-related.

In this study, two types of data on the time reference of verbs in Dutch are compared: (1) Aphasia data from a sentence completion test, and (2) ERP data from healthy participants.

Predictions

The reported differences in present and past time reference processing have been investigated in analytical verbs (which are single lexical verb forms such as ‘*writes*’), in which the values for Tense and time reference overlap. Interestingly in Dutch, reference to the past cannot only be done by a finite verb in the Past Tense, the Past Imperfect (such as ‘*wrote*’), but also by Present Tense in the periphrastic Present Perfect (such as ‘*has written*’). The latter form is more frequent in spoken language

and consists of an auxiliary in Present Tense plus a participle. These two verb forms provide an excellent opportunity to differentiate whether it is Tense or time reference that underlies the difficulties agrammatic aphasic patients encounter with verbs. If it were past time reference through Tense only, the more frequent Present Perfect should be relatively spared as compared to the (infrequent) Past Imperfect. Based on the PADILIH, it is predicted that reference to the past will also be impaired if it is done through the Present Tense.

In parallel with aphasic patients, it is hypothesized that healthy participants treat reference to the past through Past and Present Tense in a similar way. This means that in the healthy brain the ERP effects to time reference violations are caused by the *time frame* to which the verb morphology refers – and not by the Tense value per se. If that is true, the grammar-related P600 effect will occur if a past time reference violation is made, also if it is by Present Tense.

Method and results

In the aphasia study, five agrammatic patients were tested in a sentence-completion paradigm on production of Present Perfect, and Past Imperfect and Present Imperfect, with 18 items per condition. Their average accuracy scores in the conditions with reference to the past (22% on Past Imperfect and 32% on Present Perfect) did not significantly differ from each other but were both significantly lower than their average accuracy on reference to the present (53% accuracy for Present Imperfect).

In the ERP study, 32 healthy participants read sentences containing auxiliaries followed by a participle or infinitive. The auxiliaries in the contrasts had the same (Present) Tense, but different time reference values (past and non-past). Verbs referring to the past, such as in: ‘*The grandpa who before has ground the pepper doesn’t get a tip*’) were contrasted with verbs referring to the non-past, such as in: ‘*The grandpa who before *will grind the pepper doesn’t get a tip*’). The time reference violations evoked a P600 effect on the auxiliary, similar to the effect in Dragoy et al. (2012).

Discussion

This study shows that the problems with reference to the past in agrammatic aphasia are not related to Tense as such. The underlying problem is a deficit to refer to the past, as predicted by the PADILIH. The discourse-linking deficit has consequences for the production of both Tense and Aspect morphology. Past Imperfect and Present Perfect, in Dutch both used for reference to the past, are impaired agrammatic production, whereas the Present Imperfect, which refers to the present, is relatively spared.

Healthy participants interpreted the past time reference of the Present Perfect already at the point of the auxiliary. When the auxiliary cannot be used to refer to the past, a time reference violation occurs, reflected in the P600 effect. This violation effect is similar to the one found in Dragoy et al. (2012) and has to be due to the time reference of the verbs and not their Tense. It confirms that the healthy brain equally treats verb forms with reference to the past, whether they are in Past or in Present Tense. Similar to the aphasic brain, the healthy brain treats verbs referring to the past differently from verbs that do not refer to the past.

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PATHOLOGICAL GAMBLING AS A MENTAL DISORDER: A SOCIAL PHENOMENON THAT COMBINES PSYCHOLOGICAL OBSESSION AND MEDICAL REPERCUSSIONS

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Abstract/ Pathological gambling has become one of the most serious social, psychological and medical problem in the modern society. It is characteristic for all-aged people of different social status and welfare. Personal degradation, problems with a family and work, financial losses and even a suicide become rather common repercussions of the addiction. For the reason for controversial results of experiments pathological gambling requires more studies and attention of psychology, medicine and social science.

Introduction Pathological gambling can be determined as «a type of a non-chemical addiction when gaining some bonuses or prizes by means of gambling becomes the leading behavioral way to relax and to satisfy a tense need to play on money» (Kolesnikova 2009:3). Pathological gambling was classified as a disease by American Psychiatric Association in 1980 (Egorov and Malygin 2006). It means this disorder is under consideration by not only qualified psychologists but it also requires a special attention of medicine – psychiatrists in particular. To diagnose gambling such manuals as DSM–IV in the USA and MKB-10 in Europe are widely applied.

All the existing approaches in an attempt to explain the genesis of the pathological obsession are varied from psychological, emotional and cognitive (Korolenko, Malygin, Griffiths, Mayrand

2007) till neurochemical and genetical (Carlton, Regard, Ibanez 2006) ones. As a rule, the addiction is characterized by a progressive continuation developing gradually into a serious mental problem. Many scientists underline a sequence of stages through which a gambler passes (Bashkueva 2007; Enikolopov, Umnyashkina 2007; Koval, Milrud 2006).

Methods In our research to study pathological gambling levels Koval and Milrud's diagnostic method was used. According to it there exist 3 levels of development of gambling:

1) experiencing hazard (before-symptoms addiction stage); 2) being accustomed to a game (a symptom stage); 3) seeing a sense of living in a game (a syndrome of gambling) (Koval, Milrud 2006).

To study the leading incentives for participation in a gambling activity a questionnaire both for gamblers and non-gamblers has been worked out.

L. S. Vygotskiy's free association experiment to determine the character of the associations and a probable difference between gamblers' and non-gamblers' answers has been applied.

Results In the whole amount 45 people participated in the research, where 8 were pathological gamblers and the rest 37 people were students from University not attending gamble centers. Gambler's addiction was diagnosed on the basis of MKB-10 by therapists in private and public medical centers in Minsk. The age of gamblers was varied from 23 till 49 years old. As a result, it was elicited: 25 % of gamblers were referred to the first

stage; 50 % – to the second and 25 % were classified as gamblers at the third level of addiction.

The obvious correlation between a gambler's addiction stage and his gambling activity (in years) was not proved. Some probable explanations for it: 1) the progress of gambling develops individually and depends on many criteria simultaneously; 2) fast or slow development of gambling addiction is determined by the preference of a particular hazardous game or their combination.

As for the leading incentives for participation in a gambling activity, gamblers-respondents pointed out that the escape from day-to-day life and problems, a special emotional state, a feeling of risk, hazard are dominated over «financial» reasons: making a fortune, money, an additional way to earn etc.

The following table shows the gambler's answers why they attend gambling centers.

	Probable Reason	Grade
1.	Hazard	1,6*
2.	The escape from problems and day-to-day life	2,166
3.	Confidence in winning	2,33
4.	Entertainment	2,8
5.	Having a rest	3
6.	Need for strong emotions and feelings	3,25
7.	Pleasure	3,5

Table 1. Reasons for participation in a hazardous game: the gamblers' answers.

Note: The less the grade, the more important.

If to juxtapose non-gamblers' answers about the reasons for playing on money, an interesting comparison will be:

People who do not gamble tend to consider a financial stimulus as the most significant and primary in adherence to the additional behavior. It is reflected in the table:

	Probable Reason	Grade
1.	Hazard	2,13*
2.	Interest	2,25
3.	Improving financial state	2,44
4.	Strong emotions	2,44
5.	Confidence in winning	2,45
6.	“Light” money	2,57
7.	An additional way to earn	3

Table 2. Reasons for participation in a hazardous game: the non-gamblers' answers.

Note: The less the grade, the more important.

According to Vygotskiy's association experiment the following results were obtained: Pathological gamblers have 2 times more gambling associations in comparison with non-addicted people.

Non-gamblers → 5,86 (21,71 %) associations	from the whole amount
Pathological gamblers → 11,5 (43,12 %) associations	have a correlation with a game

This fact emphasizes that not only a gambler's external life (family, working, studying, social interaction) suffered from an obsessive need for a game but a gambler's internal life (a thinking process, conscious and unconscious levels of psyche) as well. It happens because a game becomes the only mistress of all the existing desires and thoughts, completely eliminating all the previous interests from an addicted person's life.

Summary Thus a unified understanding of the incentives for the participation in a gambling activity between gamblers and non-gamblers is absent. This fact underlines a complicated nature of the internal mechanism of this non-chemical addiction.

It is undoubtedly that pathological gambling is a psychological case. It is a ponderable reason for psychologists of many neighbouring spheres (social and cognitive, personal and behavioral etc.) to unite their knowledge and practical skills in a way to diagnose, to treat, to prognosticate and, of course, to prevent the development of this addiction. However, the contribution of medicine and social sciences in this process will be irreplaceable because a sober look, for example, of neurology or genetics at the internal predisposition in the development of this social phenomenon can broaden horizons in its understanding.

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NOW, WHAT TIME IS IT?: AN ERP STUDY ON TIME REFERENCE FLEXIBILITY OF THE DUTCH INDEXICAL ‘NOW’

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The descriptive meaning of the word ‘now’ is anchored in the language system, but in each different instance of speech the word ‘now’ may refer to a different point or interval in time: it is a temporal indexical. ‘Now’ has been viewed as an indexical that has a fixed reference to the moment of speech, which can be derived based on the context in which the utterance takes place. For instance, Kaplan (1989) describes how the use of ‘now’ is semantically driven to always designate ‘time of utterance’.

Contrastingly, Mount (2008) observes that in English the indexical ‘now’ need not necessarily refer to time of utterance. By narrating an event the speaker can shift away from the time of utterance to a time that is being described, thus giving the indexical ‘now’ a new value. Consequently, Mount

proposes not to treat ‘now’ as receiving its reference automatically. An implication of this claim is that ‘now’ can be paired with a verb inflected for past tense without leading to a grammatical violation, when in narration a shift to a past time frame has been made.

The aim of the current study has been to test the flexibility of reference of ‘now’ in an experimental setting and provide empirical support for one of the above made theoretical claims. Three types of Dutch sentences were designed to include a manipulation of context time frame in the first clause, reflecting narration within the boundaries of only one sentence (see (1), (2) and (3)). The time frame was manipulated in tense (past or present) and iteration (punctual, – i.e. an action that takes no more than just a moment in time-, or iterative, – i.e. an action repeated over time-). The second clause was kept the same over the three conditions, always starting with the Dutch word for ‘now’ (‘nu’) and immediately followed by a verb inflected for past tense.

- | | | | | | | | |
|-----|---|--------|---------|----------------|-----|---------|-------------------|
| (1) | *De hele middag | pikt | de zoon | snoepjes en | nu | schilde | hij de vrucht. |
| | ‘The entire afternoon | steals | the son | candy | and | now | peeled |
| | <i>[The son steals candy the entire afternoon and now he peeled the fruit.]</i> | | | | | | Present-Iterative |
| (2) | De hele middag | pikte | de zoon | snoepjes en | nu | schilde | hij de vrucht. |
| | ‘The entire afternoon | stole | the son | candy | and | now | peeled |
| | <i>[The son stole candy the entire afternoon and now he peeled the fruit.]</i> | | | | | | Past-Iterative |
| (3) | Een uur geleden | pikte | de zoon | een snoepje en | nu | schilde | hij de vrucht. |
| | ‘An hour ago | stole | the son | a candy | and | now | peeled |
| | <i>[An hour ago the son stole a candy and now he peeled the fruit.]</i> | | | | | | Past-Punctual |

For each of the three experimental conditions 75 sentences were included. To avoid repetition effects the sentences were distributed over three lists. Each list contained only one version of the experimental sentences and was supplemented with 135 filler sentences which differed from the experimental sentences in structure.

The event-related potential (ERP) method was used for the purpose of the study, as it has proven useful in investigating temporal aspects of language processing. An acceptability task was administered during measurement of the EEG signal.

Thirty-two native speakers of Dutch participated in this study. Five participants were excluded from analysis because they showed too many artifacts in their EEG signal or did not finish the test. The remaining 27 participants (18 female; mean age 22 years; all medical students,

right-handed) were distributed equally over three lists (6 female, 3 male per list).

The participants were instructed to carefully read the sentences as they were presented in a word-by-word manner at the center of the computer screen. After each sentence the participants had to indicate whether they thought the sentence was linguistically acceptable or not, by pressing on either of two keyboard buttons. Sentences were presented in three blocks. The total testing time was approximately 40 minutes. Brain activity was measured using elastic caps in which 64 electrodes were implemented. The activity was amplified 20,000 times and processed according to a standard procedure.

The results of the behavioral task indicate that individual differences exist for the appreciation of sentences of the three conditions. One third of the participants found experimental sentences to be acceptable independent of condition. This in

itself is a strong indication of the flexibility of the indexical 'now' in Dutch; according to some of the participants it is not incorrect to integrate 'now' with a past tensed verb.

Examination of the ERP waveforms showed that there was extra negativity time locked to 'now' for the punctual context sentences compared to the iterative context sentences. This negativity was most pronounced in the 500–800 ms time window and therefore could be taken as the so-called referential negativity (Nieuwland & van Berkum, 2008). No difference in processing of the past tensed verb following 'now' was found between conditions. However, for present context sentences compared to past context sentences a sentence-final negativity was found.

These differing ERP results for several sentence positions are best interpreted if language processing is seen as resulting in a model that is incrementally updated based on the incoming material: repetitive estimates of the meaning of each word are computed as each word is being processed (Baggio, 2008). At encountering the word 'now' a large shift in time frame has to be made when 'now' referring to present by default is to be integrated with punctual past context, as reflected by the late referential negativity for 'now' after a punctual past context.

Such a shift is less evident for contexts in which an iterative, although past, action is denoted. The integration of the past tensed verb following 'now' is delayed until the end of the sentence, where processing costs for the present context are evident from late negativity in the EEG, but not in the past sentences.

These results are in line with Mount's (2008) theory of flexibility of indexicals as they show that integration of a past tensed verb with 'now' for some participants is unproblematic, and for all participants varies given the set time frame. Consequently, based on our behavioral and ERP results we propose to treat 'now' as flexible indexical, rather than a fixed one.

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COGNITIVE APPROACH TO ARGUMENTATION

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The development of the cognitive approach to argumentation is related to decision making process modelling in intellectual systems. If the logical approach is based on the formal validity of reasoning, the cognitive approach is aimed at the reproduction of argumentation by means of establishing interdependencies between the content components. The problems of the cognitive approach are examined in the works of Robert Abelson (Abelson, R.P. 1973), Dale Hample (Hample D. 1992), Dmitry Pospelov (Pospelov D.A. 1989), Viktor Sergeev (Sergeev V.M. 1987), K. Korb, R. McConachy and I. Zukerman (Korb K., McConachy R. and Zukerman I. 1997), Steve Oswald (Oswald S. 2007) and others. The cognitive approach (in contradistinction to logical approach) consists in the analysis of the connections between the *contents* of representations or statements transformed. It makes the mechanism of the

cognitive modelling more flexible in comparison to the logical one, allows constructing argumentation models adjusted to the peculiarities of persuasion acts in concrete texts or speeches. At the same time, the cognitive models always depend on the context and cannot be extended to other, though similar in certain relations, mental processes. Since cognitive modelling is based on the content validity of statements used or on the structure of agent's and addressee's representations, the agent's representation of the structure of addressee's mental activity is relevant to argument set generation in the framework of the cognitive approach. *The addressee's representation in agent's mind* in the framework of the cognitive approach is a crucial component of argument set generation. Such approach makes us revise the notion of argumentation itself, the key element of which is the agent's representation of the addressee or, as we will call it further, *the addressee's representation* in the agent's mind.

The understanding that the internal representation of addressee in the agent's mind is the crucial aspect of argumentation distinguishes my approach from Dale

Hample's cognitive conception of argument. Hample also regards cognitive dimension of argumentation as basic for argumentation studies. He introduces the idea of argument₀, which "is the cognitive dimension of argument – the mental processes by which arguments occur within people" (Hample D. 1992: 92) and states that "Argument₀ is easily distinguishable from argument₁ and argument₂; it is private while the others are solely public. I believe that argument₀ provides the structures for the other two, and is the reason that we can describe all three kinds of argument in similar terms – enthymematic, inference-containing, interpretive, and so forth" (Hample D. 1992: 106). To my mind, Hample is right when he insists on the primacy of cognitive treatment of argumentation in relation to other interpretations of the notion. But van Eemeren and Grootendorst (2004) are right to criticize the attempt to include in argumentation theory all types of cognitive processes which are necessary for implementation of argumentation in an agent's and addressee's minds. What I would like to propose is that there is a crucial cognitive element that is the core of all argumentation activity, namely, generation of a set of arguments on the basis of agent's construction of an internal representation of the addressee. If we define the cognitive structure of addressee representation and identify the basic dependencies of the structure of argument set on the type of such representation, then we obtain a non-psychological mechanism of argument set generation.

Cognitive approach creates an opportunity to give a more detailed definition of the notion of argumentation as well as of the position of argumentation in the structure of real communication. Communication is always a dialogue of active parties. But in order to construct a theoretical model (which is always a simplification and cannot be a model while not being a simplification) it is reasonable to abstract from the dialogue the influence of one party on the other aimed at changing the beliefs of the latter. We will call the result of this abstraction *persuasion*. Persuasion results from the *abstraction of the unilateral nature of communication* (Bryushinkin V.N. 2008). We distract from the activity of the person whose beliefs are being changed and pay attention only to the fact whether their system of beliefs has been changed. In the course of this abstraction there emerges a *situation of persuasion*. The person who changes the beliefs of the other person will be referred to as 'agent of persuasion'. The person, whose beliefs are being changed, will be referred to as 'addressee of persuasion'. The establishment or alteration of connections between beliefs will be called '*persuasion*'.

Argumentation is a result of a *double abstraction* from the real dialogue, real communication, i.e. the abstraction from the addressee's activity and the creation of their ideal image. The main feature of argumentation is the fact that the representation of the addressee underlies the set of arguments correlated with what the agent considers the bases of the addressee's beliefs and their world model. These considerations allow us to formulate the definition of argumentation in the framework of the cognitive approach:

Argumentation is mental acts of the agent of persuasion performed on the basis of their representation of the addressee and aimed at developing a set of arguments, which, presented to the addressee, should change the system of beliefs of the latter.

This approach to argumentation clarifies the differences between the structure of persuasion and the structure of argumentation. If persuasion is an agent-agent interaction that implies the abstraction of the passivity of one party, argumentation is a *project* (cf. also Rescher N. 1998) of one person aimed at persuading the other one. In case of argumentation, we take into account only the internal representation of the addressee, which is formed by the agent of persuasion, rather than the real addressee.

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THE COGNITIVE RELEVANCE OF LINGUISTIC TRANSCRIPTION

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The sounds of language mirror the flow of thought. Transcriptions attempt to represent those sounds in a visual form, and are thus two stages removed from thought itself. Nevertheless, they can provide useful evidence for thought organization. I discuss seven ways in which transcriptions can shed light on thought, illustrating each with sounds and ways of transcribing them.

(1) Intonation units and foci of consciousness. The minimal units of discourse are the brief spurts of language that are sometimes called intonation units. They are naturally represented by the separate lines of a transcription. Typically they are one or two seconds long and exhibit a variety of prosodic properties. They are usefully interpreted as expressions of individual foci of consciousness, and thus they provide evidence that consciousness itself proceeds in a series of brief fixations.

(2) Discourse topics and the topic organization of thought. A larger scale of discourse organization appears in discourse topics, reflecting coherent thought structures that are too large to be included in a single focus. A transcription can reflect topic boundaries with added spacing or in other ways. Topics often have a hierarchical structure that transcriptions can represent with degrees of spacing or with boundary lines.

(3) Sentences and expanded foci of consciousness. Sentences have a status that is intermediate between intonation units and topics. The fact that sentence boundaries often vary between different verbalizations of the same thought suggests that sentences are not units of stored knowledge analogous to intonation units and topics.

Sentence boundaries are naturally transcribed with punctuation marks, supplemented on occasion with other prosodic markings.

(4) Prosody and emotions. Prosody plays several roles in language, but important among them is the expression of emotions. Transcriptions can represent emotional prosody to some extent with accent marks and punctuation, but when possible the inclusion of pitch and intensity contours can give a fuller picture.

(5) Disfluencies as evidence for the separation of thought from language. Although language is a significant component of thought, it is not the whole story. Evidence for the separation of thought from language is provided by the false starts and changes of wording that are important to include in transcriptions.

(6) Interlinear formats and language differences. Transcriptions of unfamiliar languages often rely on interlinear formats. Speakers are only partially aware of the analyses that such formats provide, and identifying their cognitive relevance (as opposed to their purely linguistic relevance) remains an interesting challenge.

(7) Language and music. Most of the factors listed above have parallels in music. The relation between the flow of thought in language and the flow of emotion in music has never been well studied. Comparing linguistic transcriptions with musical notation can shed important light in this area.

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COMPREHENSION OF CONVENTIONAL AND IDIOMATIC METAPHORS: RUSSIAN EVIDENCE FROM A SELF-PACED READING EXPERIMENT

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The purpose of this study is to analyze how two types of metaphors are processed compared to the same expressions used in the literal meaning (e.g. *razvalivat'sja na časti*, “fall to pieces”, about

a person and an object). One of the main ongoing debates in this field is whether metaphors are more difficult to process than literal expressions, in particular, whether to understand a metaphor, the speaker must process and reject the literal meaning of the expression first. So far, the experimental evidence is inconclusive (Glucksberg 2003, Giora 2007), and the present paper sheds new light on

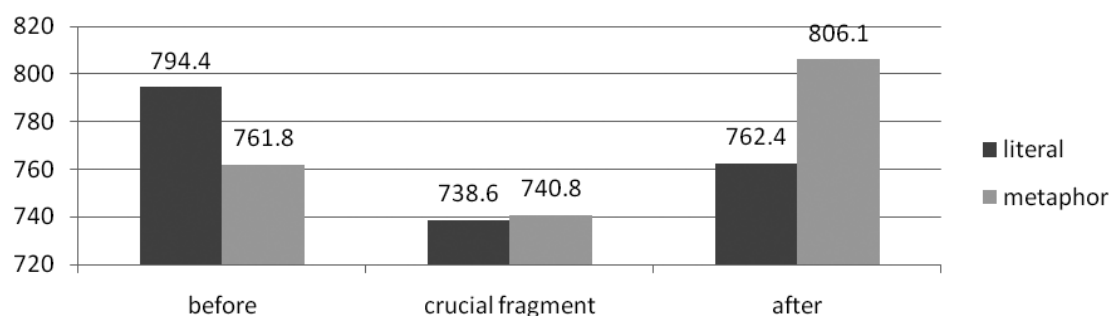


Fig. 1. Average reading times for the sentences in the conventional metaphor condition (ms)

this problem, presenting data from a self-paced reading experiment on Russian (using *Presentation* software).

To summarize the theoretical underpinnings of this debate, traditionally (starting from Aristotle), metaphors are treated as a special type of expressions, which suggests that they might be more difficult to process (Black 2002, Searle 2002). However, according to an influential theory proposed in (Lakoff & Johnson 1980, Lakoff 2002), metaphors permeate our language and thinking, allowing us to generalize our experience from one domain to another. If they are so central for our cognitive abilities, we would not expect any additional processing load to be associated with them.

The first type of metaphors used in our experiment was termed conventional. According to Lakoff's theory, such metaphors are engrained in the speakers' minds on the conceptual level: e.g. we are used to think and speak about our bodies and souls as if they were delicate objects. But linguistically, such metaphors can be expressed in different ways. E.g. the metaphor "body as a delicate object" stands behind the following expressions: *razvalivat'sja na časti*, "fall to pieces", *čuvstvovat' sebja razbitym* "feel slack", literally "feel broken", *raskalivat'sja* "to split" (about one's head) etc. The second type, idiomatic metaphors, is fixed both on the conceptual and on the linguistic level (e.g. *krepkij orešek* "a hard nut to crack" about a person).

We used a classical self-paced reading design. Sentences appeared on a computer screen one at a time. At first, all letters were masked by hyphens. The participant pressed a key to reveal a fragment of text such that each key press revealed further text and masked the previously revealed text. *Presentation* software was used to measure the time between each key press with 1 ms accuracy. After each sentence, a comprehension question appeared on the screen to control that participants

were actually reading rather than simply pressing keys.

We designed 18 pairs of target sentences (some examples are given below) and 20 fillers. Previous reading studies using different techniques show that the processing of a text fragment continues when the gaze is already shifted to the next fragment (so-called spill-over effect). Therefore each pair of target sentences contained three identical fragments: the crucial one, containing the metaphor or the same expression in the literal meaning, the one before it (to control for spill-over effects) and the one after it (to be able to analyze later stages of processing). 28 native speakers of Russian took part in our study. Average reading times for these fragments are presented in Fig. 1 and Fig. 2.

For conventional metaphors and their literal pairs, there was no significant reading time difference for any fragment. These findings support the hypothesis that metaphors are processed as easily as literal expressions. However, the crucial fragments in the sentences with idiomatic metaphors were read faster than in the sentences with identical literal expressions ($F=3,908$; $p=0,049$). We can conclude that idiomatic and non-idiomatic metaphors require different processes to be understood; that idiomatic metaphors are stored in the mental lexicon as a whole, which facilitates their processing; and that their processing definitely does not involve the assessment of literal meaning.

Conventional metaphor: *Sergej Ivanovich / k uzhasu vseh rodstvennikov / razvalivalsja na časti, / prostojav tri časa / pod prolivnym dozhdem.*

Sergei Ivanovich / to the horror of all relatives / was falling to pieces / after standing for three hours / in the pouring rain.

The same expression in the literal meaning: *Ljubimyj babuškin stul / k uzhasu vseh rodstvennikov / razvalivalsja na časti, / prostojav tri časa / pod prolivnym dozhdem.*

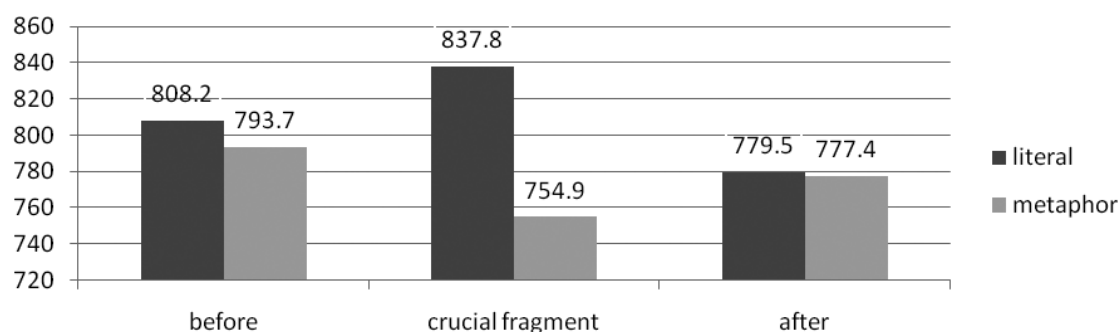


Fig. 2. Average reading times for the sentences in the idiomatic metaphor condition (ms)

The grandma's favorite chair / to the horror of all relatives / was falling to pieces / after standing for three hours / in the pouring rain.

Idiomatic metaphor: *Sotrudniki policii / nikak ne mogli / raskusit' krepkijj oreshk / kak ni staralis' / vybit' u nego / priznanie.*

Policemen / absolutely could not / bite through a hard nut to crack / however hard they tried / to beat a confession.

The same expression in the literal meaning: *Ryzhie belochki / nikak ne mogli / raskusit' krepkijj oreshk / kak ni staralis' / dobrat'sja do zernyshka.*

Red squirrels / absolutely could not / bite through a hard nut to crack / however hard they tried / to get to the seed.

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FOCUSING ON INDEFINITE NOUN PHRASES IN GERMAN AND ENGLISH: CONSEQUENCES OF REFERENCE FORM ON THE SUBSEQUENT DISCOURSE

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One of the fundamental questions underlying theories of language production concerns referent-tracking, including what referents are preferred to be picked up in the subsequent discourse and what types of referring expressions are used for this purpose. A body of linguistic and psycholinguistic studies found out that several factors and criteria influence the frequency of re-mention of referents, such as prominent syntactic positions (e.g. subjects, focus of clefts) and different thematic roles (e.g. Stimulus role in a transitive event with Stimulus and Experiencer roles). Given their high accessibility or prominence in terms of syntactic and semantic factors, these referents are furthermore likely to be picked up in the following discourse by means of a more reduced type of referring expression

(typically a pronoun) compared to their less-prominent counterparts (Givón 1983, Grosz, Joshi and Weinstein 1995). In this paper, we focus on referents mentioned in non-prominent positions in English and German, i.e. as direct objects realized as indefinite noun phrases, and argue that they differ in terms of frequency of subsequent mention and likelihood of pronominalization. The results are discussed in terms of how different types of indefinite noun phrases affect the discourse structuring potential of their referents during reference production.

Study1: The English data (Indefinite-*this* vs. indefinite-*a*)

According to several studies (Prince 1981, Ionin 2006), English *this* can be used as an indefinite determiner alongside the simple indefinite article *a* (*n*). The Experiment (**Exp1**) investigates whether referents introduced by *this* and *a* (*n*) differ in terms of likelihood of subsequent

mention and likelihood pronominalization. **Design.** We used a sentence-continuation task with no pronoun-prompt. Participants ($n=20$) read story fragments (e.g. (1)) and were asked to add five logical and natural-sounding sentence continuations to each of the stories. All critical referents were constructed in direct object position and were realized as indefinite noun phrases. We only manipulated the morphological realization of the direct objects (2 conditions: *this*-condition and *a (n)* -condition).

(1) *Sample experimental item from Exp1*

<i>this</i> -condition	<i>a (n)</i> -condition
<i>Yesterday evening was so warm that James decided to hang out with friends at the local coffee shop. On his way downtown, he saw this kid coming down the street .</i>	<i>Yesterday evening was so warm that James decided to hang out with friends at the local coffee shop. On his way downtown, he saw a kid coming down the street.</i>

Each target item contained individual references to two characters. In (1), for example, the first referent (*James*) is the clearly established topic constituent of the story fragment, as it is mentioned twice (with a proper name and pronoun) in grammatical subject position. The critical item in (1), *this kid*, is introduced as an indefinite noun phrase in direct object position in the last clause of the story fragment. In light of previous studies on indefinite-*this* (Gernsbacher & Shroyer 1989), we predict that *this*-referents will be: (i) more frequently picked up, and (ii) more likely to be mentioned with a pronoun in the subsequent discourse, compared to *a*-referents.

Results. The first part of our prediction was confirmed, as *this*-referents were picked up in the subsequent discourse more often than *a*-referents (in 85% vs. 15% of the cases). The second part of our prediction was not confirmed, as the anaphoric expressions used for both indefinite types were definite noun phrases (Fig.1.).

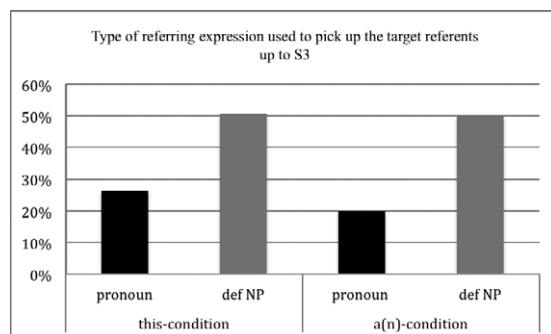


Fig. 1. Type of referring expression used for the first re-mention of the referents in the *this*-condition and *a (n)* -condition

Study2: The German data (Indefinite-*so 'n* vs. indefinite-*ein*)

The German determiner *so 'n* can be used in a similar way as English indefinite *this* (von Heusinger 2011). Experiment 2 (**Exp2**) had the same design, but tested the discourse behavior of indefinite-*so 'n* compared to that of the simple indefinite headed by *ein (e)* ('a (n) '). Again, we manipulated only the type of indefinite noun phrase, which resulted in 2 conditions: *so 'n*-condition and *ein (e)* -condition, as in (2). Our prediction is, that if the accessibility of *so 'n*-referents is comparable to that of referents preceded by indefinite-*this*, then the results of the two experiments should be similar. **Results:** Similar to the findings of Exp 1, *so 'n*-referents were picked up more often in the ensuing discourse than the *ein (e)* -referents (in 80% vs. 17% of the cases), but did not show a preference for pronominalization (Fig.2).

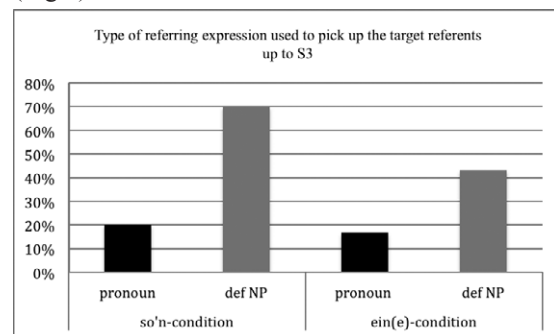


Fig. 2. Type of referring expression used for the first re-mention of the referents in the *so 'n*-condition and *ein (e)* -condition

Conclusions: First, both indefinite *this* and indefinite *so 'n* signal the likelihood of subsequent mention of their referents. Second, the findings of both Exp1 and Exp2 underline the necessity to dissociate between likelihood of subsequent mention and likelihood of pronominalization, as they do not point to the same type of accessibility of a referent. Third, we argue that the different markers of indefinite noun phrases (i.e. *this* in English and *so 'n* in German) were developed to distinguish between accessible and non-accessible referents when realized as direct objects, as such referents are better competitors for the subject referents, at least in terms of likelihood of subsequent mention.

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THE POSITIVE INFLUENCE OF INTRANASAL INSULIN ON SPATIAL MEMORY IN RATS WITH NEONATAL DIABETES MELLITUS

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Type 2 diabetes mellitus (T2DM) is a metabolic disease associated with many complications including CNS disorders referred to as diabetic encephalopathy. They are manifested as decreased activity of all cognitive functions, and impaired verbal, visual and working memory (Kodl and Seaquist 2008). However, the causal factors responsible for CNS complications in T2DM and the mechanisms of pathogenesis that lead to neurodegenerative diseases have not been fully elucidated. The data is available according to which in the brain the alterations and abnormalities in the signaling systems regulated by insulin, insulin-like growth factor-1, biogenic amines and peptide hormones, and the changes in expression of the components of these systems induce disturbances in the growth, differentiation, metabolism and apoptosis in neuronal cells and contribute to triggering neurodegenerative processes and the development of cognitive deficit and other CNS disorders in patients with T2DM and animals with experimental DM (Gerozissis 2008).

The aim of the present work is to study, first, the influence of metabolic alterations associated with DM on formation of the long-term spatial memory and learning in Morris water-maze (MWM) test in female rats with neonatal model of T2DM and, second, the influence of intranasal insulin (I-I) on the cognitive functions in diabetic rats. The influence of I-I on the functioning of the diabetic brain was assessed studying the binding parameters of insulin receptors (IR) and the gene expression insulin receptor substrate 2 (IRS2), the upstream components of the insulin signaling system.

Neonatal rats (5 days) were treated intraperitoneally with a single dose of streptozotocin (80 mg/kg), which led to impairment of glucose tolerance and mild hyperglycemia, typical of T2DM, in adult animals (Hemmings and Spafford 2000).

The insulin receptor binding in the synaptosomal membranes was evaluated using [¹²⁵I]-insulin, and the IRS2 expression in the brain areas was estimated by RT-PCR. A week before and during 39 days of cognition experiments diabetic and non-diabetic rats received daily I-I (0.48 IU/rat every day) or placebo. A spatial memory and learning were studied in spatial version of MWM test (Van Dam et al. 2006).

The insulin binding capacity of IR in the synaptosomal membranes isolated from the brain of diabetic rats practically did not differ from the control. The expression of IRS2 gene in the hypothalamus of diabetic animals was decreased by 68% compared with control, and I-I treatment fully restored IRS2 expression decreased in T2DM. It had no effect on the levels of IRS2 mRNA in the cortex and olfactory bulbs, which in T2DM did not differ significantly from the control. The obtained data gives evidence for I-I-induced restoration of functional activity of the initial components of the insulin signaling system in the hypothalamus in T2DM and allows IRS2 to be regarded as a target of therapeutic action of I-I.

Using WMW test we found that the length of path in swimming tracking of diabetic and control rats differed significantly. In the first series (days 1–5) of experiments, to locate the platform it took the diabetic rats, on average, twice as long as control animals. The dynamics of time reduction in locating the platform was less pronounced compared with control animals. In the second series (days 35–39), the escape latency in diabetic rats was 3–5 times longer compared with control animals. On the first day of the second series the search time to locate the platform in diabetic rats increased by 70% compared with the last day of the first series, while the corresponding parameters of the control were not changed. The number of annulus crossings in diabetic rats decreased by 45% in the first series and by 40% in the second series compared with control. These findings indicate the development of cognitive deficit in rats with neonatal T2DM, as is illustrated by impairment of their learning and spatial memory in comparison with healthy animals.

In diabetic rats I-I made the latency period three times shorter, on average. The maximal effect of I-I was five times, at most, the reduction of escape latency in the first and the second series of experiments. As far as I-I-treated diabetic rats are concerned, in the second series the length of swimming path was similar to that of control and I-I-treated non-diabetic rats, being significantly shorter than in the case of non-treated diabetic animals. The number of annulus crossings in the case of I-I-treated diabetic rats increased compared with diabetic animals and on the 39th day of testing the difference in this parameter between untreated and I-I-treated diabetic rats was statistically significant at $P < 0.05$. These furnishes grounds to say that I-I improves the long-term spatial memory in diabetic rats, making it similar to healthy animals. A decrease of time required to locate the hidden platform, a shorter swimming path, as well as higher swimming speed and the increased number of annulus crossings in the case of I-I-treated diabetic animals show the insulin-induced improvement of learning in rats with the neonatal model of DM.

Summing up, the obtained data give strong evidence for the benefit of I-I in the treatment of T2DM to prevent neurodegenerative diseases and cognitive deficit, and indicate that insulin signaling system, the major component of overall hormonal network in the brain, is an important target in the therapy of DM-induced CNS diseases.

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SPECIFIC VERSUS GENERAL ACCOUNTS OF COGNITIVE CONTROL: EVIDENCE FROM THE STROOP

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Cognitive control is the ability of human mind to organize its own cognitive processes. One of the most important debates in the cognitive control research is whether this ability is founded on some general and global cognitive mechanism. It is being proposed (e.g., Braver, Paxton, Locke, & Barch, 2008; Koechlin & Summerfield, 2007) that there exists global control, which is involved in most of the situations, and which adapts to the requirements of those situations. However, some authors (e.g., Egner, 2008; Nigg, 2000) provide the evidence that in order to deal with different control problems, the human cognitive system is equipped with many distinct, low-level and very specialized control processes, and no general control can be found.

Our goal is to investigate this controversy in regard to so-called Stroop interference (MacLeod, 1998). The classical Stroop task (so called the color-word task) consists of naming a color of a colored word which itself means an incongruent color. Interference effect, namely a positive difference

between RTs for incongruent and neutral stimuli (e.g., colored letters X), reflects the additional time consumed by the control processes while overriding the interference from a dominant process (reading). Other popular version is the picture-word task, which consist of naming a picture including an incongruent word (e.g., a picture of the dog with a word "cat" placed in it). Some recent models of the Stroop (van Maanen, van Rijn, & Borst, 2009) assume a general mechanism underlying both tasks, but appearing at different stages of processing. Contrary to this view, we suspect that these two types of interference may differ qualitatively, especially with regard to the involvement of negative priming.

The negative priming effect is widely explained in terms of persisting inhibition of the stimulus representation from a preceding trial, resulting in an impaired access to that representation in a current trial (Tipper, 1985). On the contrary, the inhibition of a response is best described by the horse-race model (Logan & Cowan, 1984), which assumes that some residual activation of the previously stopped response tendency should be present also in a current trial, leading to no negative priming effect. Following this logic, we expected the negative priming effect in the picture-word task, assuming the semantic (representational) nature of conflict

in this task, while no such effect was expected in the color-word task, which probably imposes a response conflict.

A total of 81 women and 42 men participated. Mean age was 21.1 years ($SD = 3.1$, range 18–40). 70 people were randomly assigned to the color-word task, and 53 – to the picture-word task.

The stimuli in the color-word Stroop were four capital Polish words naming red, green, blue, and black colors. Each word could be printed in one of respective ink colors. In case of the picture-word task, the stimuli were four figures (square, rhombus, circle, & oval). Each congruent stimulus contained a word meaning the color/figure, respectively. Incongruent stimulus contained a word meaning another color/figure. In each task, two fingers of each hand were dedicated to responding. A total of 80 congruent and 80 incongruent stimuli were applied, in a random order. Each stimulus was presented for 2.5 s and then was followed by a mask shown for 1 s.

The independent variables were: the task, the type of a trial (congruent vs. incongruent), and whether a trial was primed (P) or not (N). In primed trials, the distractor feature (a word) from the preceding trial referred to a target feature (a color or a figure, respectively) in a current trial. In non-primed trials a target feature in a current trial was not related to the preceding distractor feature. DV was the mean latency of correct responses directly following a correct response. Response latencies shorter than 300 ms or longer than 2200 ms were eliminated from the data set. P trials constituted 18.6% of trials in both tasks, while the remaining 81.4% were NP trials.

A few participants were excluded due to low accuracy. We ran $2 \times 2 \times 2$ ANOVA in order to test the effects of the three independent variables on DV. There was no significant main effect of the task ($F < 1$): participants responded to both task with comparable latency. As could be expected, responses in congruent trials were significantly faster than in incongruent trials, $F [1, 115] = 26.5$, $p < .001$. The priming effect was also significant, $F [1, 115] = 5.7$, $p = .017$, however the priming entered a two-way interaction with the type of the task, $F [1, 115] = 5.8$, $p = .015$. There was a significant negative priming in the picture-word task, both in congruent (801 vs. 876 ms, in NP vs. P trials, respectively; $p < .001$) and incongruent trials (856 vs. 927 ms, in NP vs. P trials, respectively; $p < .001$). On the contrary, in the color-word task, the differences in mean latencies between P and NP trials were not significant ($ps > .15$), neither in congruent (825 vs. 845 ms, in NP vs. P trials, respectively) nor in incongruent trials (929 vs. 916 ms, in NP vs. P trials, respectively). In each of the tasks, priming selectively affected

interference effects. In the color-word task, priming significantly decreased interference, $F [1, 152] = 3.88$, $p = .049$, but it did not yield significant effect ($p > .6$) in the case of the picture-word task.

Summing up the results, the picture-word task was subject to evident effect of negative priming. This effect was huge (75 ms on average), as it surpassed the interference effect (53 ms on average). On the contrary, no priming effect on RTs was observed in the color-word task. The opposite pattern of results regarded the interference effect. It was decreased by priming in the color-word task, but no such an effect was present in the picture-word task. The results support the hypothesis that negative priming, resulting from inhibition of some mental representations, is only present in the picture-word task, probably because only in this task the conflict regards such representations. On the contrary, processing colors in the color-word task probably directly activates respective motor responses, so mean RTs are not affected by priming. However, probably due to some residual response activation, priming had also a positive influence on conflict resolution in that task, resulting in a lowered interference. If one mechanism supported resolution of interference in both tasks, then it should be influenced by negative priming in similar ways, but the opposite data were found. Thus, our original work suggests that the color- and picture-word interference effects are not supported by the same general control mechanism, but they represent different and specific conflicts within human cognitive architecture.

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RESPONSE STRATEGIES IN ARTIFICIAL GRAMMAR LEARNING TASK

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Introduction

Artificial grammar learning (AGL) task is one of the most popular tasks used to study implicit learning (e.g. Reber 1968; Dienes and Scott, 2005). Participants are to memorize letter strings created according to the specific rule, which they are unaware of. After learning phase participants, being informed about the existence of the rule, are to classify new strings as consistent or not with the rule. Usually the classification performance is significantly above chance level, despite participants are unable to describe the rule.

Numerous AGL studies reveal individual differences in task performance (see: Underwood 1996). Nevertheless in most of those studies individual differences were treated as a “noise” (Kaufman et al. 2010). Only few researchers treat implicit learning as an ability. Most of those studies concern relations between intelligence and implicit learning. Kaufman et al. (2010) investigated broad number of links between personal variables and performance in implicit learning task. Amongst all they inquired relations between implicit learning and processing speed. Kaufman et al. (2010) argue that even in the absence of implicit learning’s associations with complex cognitive processes (such as intelligence), differences in implicit learning should be related with the processing speed, as both processes share primitive and broad nature. Salthouse et al. (1999) found that implicit learning is related to processing speed measures from WAIS IQ battery. In the study by Kaufman et al. (2010) processing speed (measured with various speed tests, e.g. the one from WAIS) was the only elementary cognitive process to which implicit learning was significantly related.

Links between implicit learning efficiency and trait impulsivity were also investigated. Strack and Deutsch (2004) claim, that the impulsive system involves an associative network that is automatically activated through learning and experience. It is fast and needs no attentional resources. Such characteristic suggests that implicit learning ability may be positively associated with trait impulsivity. According to Whiteside et al. (2005) four major dimensions of impulsivity are: urgency, lack of premeditation, lack of perseverance and sensation seeking. Kaufman et al. (2010) hypothesize that the most relevant form of impulsivity for implicit

learning is lack of premeditation. Therefore, individuals who deliberate extensively may do so in part because they are poor at detecting incidental covariances, which then leads to deficiencies in quick and intuitive decisions. According to their results, a correlation between implicit learning and lack of premeditation can be observed. Participants with higher implicit learning scores deliberate less about decisions in their daily lives.

We assume that forcing subject to react fast vs. forcing subjects to react slow affects AGL task performance. Such manipulation will experimentally raise lack of premeditation vs. extensive deliberation. Furthermore we assume that individual differences in performance in AGL task result from response strategies applied in testing phase (reflexive vs. confirmatory). Therefore we hypothesize that:

1. Time restrictions in classification phase will alter response strategies that influence overall accuracy as well as “regular”/“irregular” response ratio.
2. Forcing subjects to respond faster will cause confirmatory strategy, which will be observed as higher rate of “regular” responses.
3. Forcing subjects to respond slower will cause reflexive strategy, which will be observed as lower rate of “regular” responses.
4. Applying confirmatory strategy will result in increase of string classification accuracy.

Experiment 1

Method

Participants (N=88) performed computerized AGL task. Material we used was taken from the work by Higham (1997). Participants were randomly divided into three groups, differing in the instruction and feedback in the test phase. All participants performed learning phase at first. They were informed that they are participating in a memory test and their task is to memorize letter strings that are to be presented. In the learning phase 16 grammatical strings were presented 3 times in random order. Each trial consisted of letter string, (5 s), followed by the blank screen (300 ms). Then, before the testing phase participants were informed that the strings they were presented were composed due to a rule. They were asked to classify new strings as consistent with this rule – “regular” or not – “irregular” by relevant keypress. Those in forced accelerated response group were to respond fast (not longer than 1.5s) and those in forced decelerated response group were to react slowly (not faster than 1.5s) and consider their decisions. The instruction in control group did not mention

the required response speed. Test phase consisted of 64 strings (32 grammatical). Presentation of each string was followed by a blank screen (300 ms). In forced accelerated and forced decelerated groups if response was too fast or too slow (depending on the group), feedback informing about this violation was provided. In control group each string was presented till response. The whole experiment lasted about 15 min.

Results and conclusions

Manipulating response timeouts influenced regular/non-regular response ratio. Participants in the forced accelerated response took more confirmatory strategy (significantly more “regular” responses in forced accelerated response than in forced decelerated response group, post hoc analysis significant at $p=0.029$). Changes in strategy did not alter task performance accuracy. Nevertheless being significantly above chance, task accuracy was very low (53,38%). This could have blurred actual results so that experiment 2 was performed.

Experiment 2

Method

Task procedure was the same as in exp 1. The only difference was that we used grammar by Dienes and Scott (2005), which was shown to elicit

higher classification accuracy. The learning phase consisted of 15 strings repeated 3 times. Test phase consisted of 60 strings (30 grammatical).

The data from experiment 2 is currently being processed.

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COGNITIVE INHIBITION UNDER CONDITIONS OF HIGH/LOW AVOIDANCE-MOTIVATED NEGATIVE AFFECT

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Introduction

Link between emotion and cognition is one of the thoroughly studied fields in cognitive psychology. Despite the fact that inhibition is one of the key aspects of cognitive control, only few studies investigated emotional modulation of these processes (Mitchell, Phillips 2007). Finkelmeyer et al. (2010) found that positive mood leads to increase in the inhibitory costs in Stroop task, while negative affect may reduce Stroop interference. Apart from influences on inhibitory processes, emotions modulate breadth of attentional scope as well. It is often stated that positive emotions broaden attentional scope, whereas negative emotions narrow it. Nevertheless Gable and Harmon-Jones (2008) showed, that these links are motivation-modulated – approach-motivated positive emotions narrow the attentional scope. In their study particular affective and motivational states were evoked by:

(a) presenting a film at the beginning of the study, (b) presenting block of pictures at the beginning of the study, or (c) between trials. As a measure of attentional breadth Kimchi and Palmer’s (1982) and Navon’s (1977) task were used. In the latter study Gable and Harmon-Jones (2010) have also shown that low-motivation negative affect caused attentional broadening, whereas disgust, high-motivation negative affect narrowed attentional focus.

Having those results in mind, it is worth investigating whether motivation intensity rather than affect itself influences cognitive inhibition.

Here we focus on negative affect, to which not much attention was paid in previous studies. We hypothesize that approach/avoidance motivation modulates influence of negative emotions not only on attention but on inhibition processes as well. While high avoidance-motivated negative affect is evoked (by the presentation of particular, standardized pictures), the inhibitory functioning is better – what can be seen in better performance in stop and go/no-go tasks. While low avoidance-motivated negative affect is evoked, the inhibitory

functioning is worse – what is shown in poorer performance in those tasks.

Experiment 1

In order to select material for the study, a pilot experiment has been conducted. Subjects (N=50) rated on the 1–9 scale, 240 successively shown pictures. They assessed if particular picture evokes approach or avoidance motivation. Pictures (90 negative – 45 with expected high avoidance – e.g. gun and 45 with expected low avoidance motivation – e.g. cemetery; 90 positive – 45 with expected high approach – e.g. dessert and 45 with expected low approach motivation – e.g. flower; and 60 neutral – e.g. shoes), were selected from the International Affective Picture System (IAPS; Center for the Study of Emotion and Attention [CSEA], 2005) on the basis of their affective valence ratings (Lang, Bradley and Cuthbert 2005). Pictures were matched for the arousal level and for low level of sex differences in ratings (Lang et al. 2005). Basing on the participant ratings, 90 pictures were chosen for the following study (40 neutral, 30 high avoidance-motivated, 30 low avoidance-motivated). Pictures in negative affect groups differed in valence from those in neutral group. Pictures in high avoidance-motivated affect group differed in avoidance rating from pictures in both neutral and low avoidance-motivated negative affect groups.

Experiment 2

64 subjects took part in the main experiment. All subjects reported normal or corrected to normal vision.

First participants were filling in STAI questionnaire. Then they were performing 2 computerized tasks measuring inhibition. They were assigned to one of three groups differing in IAPS pictures being presented: (1) high avoidance – motivated negative affect (pictures of e.g. snakes, spiders, wounds, weapons); (2) low avoidance – motivated negative affect (pictures of e.g. sad people, graves); (3) neutral affect – (pictures of e.g. people, streets, buildings). At first they performed go/no-go task in which they were to decide if the presented letter is a vowel or a consonant (letters: a, e, i, o, u, y, s, r, n, g, c, l were being presented). First

session of the task consisted of 96 go trials. Then in the go/no-go session participants were told not to react when letters a and c were presented. No-go trials were 20% of the trials in that session. In both sessions each trial consisted of a presentation of an IAPS picture (800 ms) followed by a target letter, presented till response or 1500 ms. New trial started after 300 ms. Then participants performed stop-signal task in which they had to discriminate the direction of presented arrow. 20% of the trials were stop trials – the black arrow changed its color into red after 200 ms. In those trials subjects were to refrain from reaction. Before presentation of an arrow (both in “normal” and in “stop” trials) an IAPS picture was presented for 800 ms. After performing those computerized tasks, participants were assessing on 11 point Likert scale: (1) what kind of affect (positive vs. negative) was evoked by the presented pictures, (2) what kind of motivation (approach vs. avoidance) was evoked by the presented pictures.

Data are being processed and analyzed. Additionally, approach-avoidance motivation norms for IAPS pictures will be provided online, which can be useful for further investigations.

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AGE VARIATIONS IN THE USE OF SPEECH AS A PROBLEM-SOLVING TOOL

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Human ontogeny entails the construction and use of semiotic mediational means to regulate psychological functions intrapersonally and interpersonally. In the Vygotskian school of

thought, speech is regarded as both a mediatory tool and a mediated higher mental function and as such, is considered central to the development of children's cognition. Founded in Vygotsky's (1986) seminal work on speech as an instrument of thought, this study examined speech internalisation and the dynamics of verbal mediation of problem solving in children and young adults with specific focus on the use of social, private and inner speech in task execution. The aim of the study was to investigate comparatively the incidence of speech produced by children and young adults during problem solving. Pre-primary and primary school children divided into four age groups and a sample of University students with equal distribution of male and female participants completed the Coloured and the Standard version of the Raven's Progressive Matrices, respectively. The participants were of different ethnic origin but all spoke English as their first language. To create a stimulating social environment, the participants of the same age group were placed in groups of three. Thus, task execution was individual but took place in a socially supportive context in which each child was able to solicit (and receive) *ad hoc* assistance from peers or from the researcher.

In a one-way MANOVA, it was demonstrated that there was a significant effect of age (age groups 1 to 5) on the combined dependent variable speech type, $F(12, 390) = 8.94$, Pillai's trace = .65, $p < .05$, $\eta^2 = .22$. Analysis of each individual dependent variable using Bonferroni adjusted alpha level of .017 showed that there was a significant univariate main effect of age group on social speech, $F(4, 130) = 3.66$, $p < .001$, $\eta^2 = .1$; on private speech,

$F(4, 130) = 8.01$, $p < .001$, $\eta^2 = .2$; and on inner speech $F(4, 130) = 20.1$, $p < .001$, $\eta^2 = .38$. The five age groups differed in terms of all three individual dependent variables. In children alone, the exploration of the use of speech by means of a one-way MANOVA also indicated that there was a significant multivariate main effect of the between-subjects factor age group (age groups 1 to 4) on the combined dependent variable speech type, $F(9, 348) = 7.31$, $p < .001$, Pillai's trace = .48, $\eta^2 = .16$. Each of the three types of speech demonstrated an age-related change and followed a distinct ontogenetic trajectory.

Across childhood and early adulthood, social speech followed a complex polynomial trend, both linear and cubic, but primarily compliant with features of a linear decrease. Both inner and private speech initially increased and subsequently decreased, thus conforming to a curvilinear trajectory. A specific analysis focusing on the pattern of speech production in the youngest and

the oldest participants, revealed that in the one-way Repeated Measures ANOVAs, there was a significant difference in the use of the three speech types in both the preschoolers group, $F(2, 58) = 10.78$, $p < .05$, $\eta^2 = .27$ and in the students group, $F(2, 28) = 7.5$, $p < .05$, $\eta^2 = .35$. Preschoolers relied extensively on social speech ($M = 1.34$, $SD = 1.75$), then on private speech ($M = 1.17$, $SD = 1.7$), and the least of all—on inner speech ($M = 0.2$, $SD = 0.4$).

Young adults relied preferentially on social speech ($M = .76$, $SD = .95$), then on inner speech ($M = .2$, $SD = .17$) and minimally on private speech ($M = .04$, $SD = .11$). The comparison of these profiles using a one-way MANOVA indicated that there was a significant effect of group (preschoolers and students) on the combined dependent variable speech type, $F(3, 41) = 2.89$, $p < .05$; Pillai's trace = .17; $\eta^2 = .17$. Using Bonferroni adjusted alpha level of .017, it was revealed that preschoolers and students differed in terms of their use of private speech but were compatible with reference to their production of social and inner speech.

The comparative exploration of the distinct profiles of verbal mediation in young children and adults, which demonstrated that the two groups relied extensively on the use of social speech support Vygotsky's view on the role of peer collaboration for mediating individuals' cognitive functioning. The fact that unlike children, young adults relied minimally on private speech, compared to social and inner speech, supports Vygotsky's view, shared and verified by many contemporary empirical studies (e.g., Matuga, 2003; Girbau, 2002; Winsler, De Leon, Wallace, Carlton, & Willson-Quayle, 2003), that with age private speech "goes underground". It was concluded that verbal mediation is age-variant and that explicitly social forms of verbal mediation permeate individuals' cognitive repertoire continually from childhood to adulthood.

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LISTENING TO THE CONDUCTOR: AN ANALYSIS OF VISUAL TEMPO SIGNALS

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Experimentation with auditory and visual processing of temporal events has time and time again revealed an auditory dominance over vision in detecting changes in frequency, detecting bifurcations between multimodal synchronies, and when interacting with rhythmic events. With so much literature showing auditory dominance in tempo perception, a musician might wonder if or how an orchestral conductor uses visual signals to control the production of auditory tempo in an orchestra. While much of the cannon of conducting literature breaks down gestures to study expressiveness, emotional conveyance, dynamic levels, and even pragmatics and semiotics of conducting, there is a deficit of studies that focus on the temporal aspects of conducting (for a brief review, see Luck & Nte, 2008). Herein, evidence is gathered from several studies to shed light on such visual signals of tempo and their effect on musicians.

The initial study in this investigation tested professional musicians' ability to detect temporal bifurcations between a filmed conductor and a visually occluded orchestra (Danz & Janyan, 2009). In this study, the visual motions of a conductor were suddenly changed by a factor of +20%, -20%, +5%, or -5% while the auditory portion of the orchestra was left unchanged. Participants were asked to press a button if and when they became confident that a discrepancy occurred. Musicians with a mean of 10.63 (*SD* 7.00) years of orchestral experience had difficulty detecting the visual discrepancy onset resulting in mean error rates ranging from 13% to 73% (see table 1) albeit quite significant visual tempo changes.

	5%Δ		20%Δ	
increase	36%	(33)	18%	(19)
decrease	73%	(29)	13%	(22)

Table 1: mean error rates and standard deviations.

One explanation of these findings could be the distribution of attention between auditory and visual modalities during temporal judgments. Repp and Penel (2004) showed that when tapping in synchrony with a visual frequency, an auditory distracter frequency will greatly affect one's

ability to synchronize. Yet when tapping with an auditory frequency, visual distracters do not have as great an effect. Furthermore, the act of tapping or any other type of sensory motor coordination has greater weight towards auditory interaction than with vision (Repp & Penel, 2002). This could also be extended to the motion of a bow in stringed instrument performance, the tapping of valves in wind instruments, and the striking of percussion instruments. If visual stimuli act as distracters during temporal judgments, the notion of conductor as time keeping becomes puzzling.

Our second study tested the ability to detect changes in frequencies while auditory and visual processes work together, perceiving synchronous events (Danz, 2011; in Russian). Simplifying the stimuli from the initial experiment, participants were asked to detect changes of tempo in 1) an auditory beep, 2) a visual blinking dot, and 3) both the beep and dot in synchrony. All stimuli exhibited a base tempo of 120 bpm (2 Hz) and changed by either +5% or -5%. By comparing detection of frequency change between combined modalities and their constituent modalities, a representation of modality contribution may emerge. As seen in table 2, except for auditory detection of frequency increases, uni-modal detections resulted in higher than 60% error for both vision and audition. However, when modalities were combined, performance greatly improved in these conditions and showed no difference between increase and decrease conditions.

	Auditory		Visual		Auditor + Visual	
increase	24.74%	(15.92)	62.24%	(14.79)	46.87%	(17.64)
decrease	75.52%	(16.24)	65.52%	(18.29)	46.61%	(21.15)

Table 2: mean error rates and standard deviations.

A possible explanation for the higher accuracy in the auditory-increase condition might be a combination of fast auditory processing with the fact that an increased tempo means an unexpected early arrival of the first beat after the tempo change. This unexpected arrival may result in a more obvious signal. Nonetheless, when modalities are working together to detect the change in frequency, slower visual processing may hinder this early detection.

These results suggest that tempo changes of an orchestra and conductor in synchrony may yield the appropriate response by a musician as opposed to visual tempo change of a conductor in competition with an unchanging orchestra (Danz, 2011). Further evidence is seen when testing musicians'

ability to play their instrument in synchrony with an audio-video recording of a conductor and band (Fredrickson, 1994). High school level musicians perform greatest when given both auditory and visual support as opposed to losing one portion or both. These studies have shown that when auditory and visual cues are aligned a musician may respond appropriately to changes in tempo but the conductor alone cannot influence tempo change judgments with the same level of accuracy.

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DYNAMICS OF FUNCTIONAL BRAIN CORTEX CONNECTIONS AT STAGES OF FIGURATIVE CREATIVE PROBLEM SOLVING DEPENDING ON THE PARTICIPANTS' CREATIVITY LEVEL

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Background.

Researches of dynamics of brain activity at different stages of creative process are not numerous yet and they are performed on the basis of verbal tasks – for example, the solving of anagrams, the composition of stories, etc. (Fink and Neubauer 2006, Jung-Beeman et al. 2004, Martindale and Hines 1975). Also there is insufficient research devoted to studying the neurophysiological correlates of nonverbal creativity. At the same time such kinds of nonverbal activity as art, design, and music differ by a highly creative component.

Issues of the functional organization of brain cortex while nonverbal problems solving by the person with the help of insight strategy, of dynamics of brain activity at different stages of creative process in individuals with different creativity level are not studied nowadays. Meanwhile knowledge about psychophysiological mechanisms of creative thinking while solving not simulated but real problems of a routine and professional life, is claimed by applied psychologists, managers, teachers and others.

Method.

We hypothesized that dynamics of the brain cortical functional organization during the

performance of nonverbal (figurative) creative problems will differ depending on participants' creativity level.

The objective of our research is to study dynamics of functional brain cortex connections at different stages of figurative creative problem solving depending on the participants' creativity level.

95 right-handed senior pupils and university students aged 16–22 and having drawing experience took part in our research (52 females and 43 males). In compliance with the results of the psychological Tests of Creative Thinking ("picture completing") by Torrance they were divided into two groups – with the **medium** (50 participants) and high (45 participants) level of nonverbal creativity.

They were asked to perform nonverbal creative tasks of two kinds. The first task completely corresponded to conditions of laboratory experiment. And second task was the model of natural activity of subjects, but was organized in laboratory conditions as well. In the first task the participants were asked while scanning geometrical figures (a circle, a semicircle, a triangle and a rectangle) to invent an original picture or a subject made from these geometrical figures, and then to draw it. The second task was a work with monotypies. Monotypies are sheets of paper with colour prints on them. Participants were offered to stare attentively at each monotypies, and to try to see and mentally create an artistic image or a

picture on the basis of any of them. Carrying-out of this task is closely connected with insight.

EEG signals were recorded at a resting state, and at the stages of nonverbal problem solving – at the preparation stage (at the beginning of solving, after an instruction's presentation), before insight and at the verification stage from 21 scalp electrodes according to the International 10–20 System. We asked subjects to indicate their insight responses by pressing the button “idea” in order to differentiate creative thinking process into two stages – insight stage (before pressing the button “idea”) and a verification or check stage (after pressing the button “idea”). The participants were asked to draw the invented picture after the finishing of EEG signals recording. We analyzed EEG coherence for each subject in the frequency bands: theta-1 (4.00–6.00 Hz), theta-2 (6.00–8.00 Hz), alpha-1 (8.00–10.5 Hz), alpha-2 (10.5–13.00 Hz), beta-1 (13.00–24.00 Hz), and beta-2 (24.00–35.00 Hz).

For statistical analysis we used 3-way ANOVA (Thinking Stage \times Band \times Kind of Connection) and comparative post hoc analysis by Fisher criterion.

Key Results.

On the basis of received results of our research it is possible to confirm the different dynamics of the functional organization of brain cortex in high-level creative and **medium**-level creative participants at different stages of solving nonverbal creative problems.

1. The insight stage of the nonverbal creative process in comparison with the resting state is characterized by an increase in force of long functional connections in all participants. And at the low-frequency bands reflecting a functional state of the central nervous system a strong interhemispheric interaction is revealed directly before insight. And at high-frequency bands relative to the very cognitive activity an intrahemispheric interaction between anterior and posterior brain cortical regions is revealed.

2. Highly-creative individuals as compared to medium-creative ones are characterized by a high functional brain specialisation of carrying out figurative creative problems. They have a more brightly dynamics of significant coherences and

a stronger synchronization in all frequency bands at different stages of solving nonverbal creative problems.

3. Medium-level creative individuals have a general brain cortex activation as a neurophysiological precondition of a nonverbal creative problem solving. A raised emotional tension at poorly expressed cognitive processes prevents from nonverbal creative problem solving in these individuals. It is reflected in a high EEG synchronization in low-frequency bands and in a low synchronization in the high-frequency bands at preparation stage.

4. The insight stage of high-level creative individuals is characterized by a decrease of voluntary attention level, by strengthening of cognitive processes integration and an emotional tension connected with a high cognitive loading. It is reflected in high frequency beta-1 and beta-2 resynchronization in left anterior and posterior regions, in strengthening of alpha-1 and alpha-2 synchronization in right hemisphere and in strengthening of low frequency theta-1 and theta-2 interhemispheric synchronization.

Conclusions.

We revealed the most strong coherence at low frequency bands as compared to high frequency ones in high creative subjects directly before insight. But we didn't reveal interhemispheric connections at high frequency bands. Hence, while insight solving of nonverbal creative problem, high-level creative individuals are characterized by independent and parallel functioning of brain hemispheres. Whereas strong coherence is revealed in these individuals during the preparation and verification stages at high frequency bands.

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DISTINCTIONS OF WAVE'S COMPONENTS OF EVENT-RELATED POTENTIALS DURING FALSE AND TRUTHFUL RESPONSES

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Introduction: The problem of revealing of the hidden information is actual all over the mankind development. For a designation of ways of the information concealment one uses a number of concepts – lie, a deceit, default, etc. “Deception is a successful or unsuccessful deliberate attempt, without forewarning, to create in another a belief which the communicator considers to be untrue” (Vrij 2008: 15).

The polygraph traditionally has involved measures of peripheral physiological manifestations thought to be involved in deception and lie or to relate to guilty knowledge. And though people sometimes call a polygraph a lie detector it does not detect lies, but only physiological activity that is assumed to accompany telling a lie. Moreover the state of the checked person, his intellectual and character features, interhemispheric asymmetry and mode of thinking can influence reliability of result at revealing of the hidden information by means of a polygraph. So more recently attempts have been made to investigate alternative or additional measures of deception detection, for example, brain function with the help of such method as Event-related potentials (ERP) (Cutmore et al. 2009, Johnson 2006, Kireev 2010, Rosenfeld et al. 2004).

Purpose of our research is to study the dynamics of interhemispheric distribution of ERP components in different areas of brain cortex during realization of false responses in experiment participants with different modes of thinking depending on interhemispheric asymmetry.

Methods: 72 healthy right-handed students-volunteers (34 males and 38 females; Mean 22.1 years old) took part in the experiment. The ERP-based in the oddball paradigm Guilty Knowledge Test was used in present research. The aim of the Guilty Knowledge Test is to examine whether examinees possess knowledge about a particular crime that they do not want to reveal. We modeled a situation in which students had internal motivation to deceive. They were asked to make truthful or deceptive responses concerning whether they used the crib at passing an examination (Figure 1).

Bioelectric brain activity was recorded using 21 argentums chloride electrodes according to the international 10–20 standard. Mode of thinking (left-hand, right-hand, mixed and combined modes) depending on interhemispheric asymmetry was tested by means of a technique “A Choice of the side” by E. P. Torrens. We used statistical post hoc analysis to compare the ERP amplitude and latency in various areas of brain cortex and hemispheres in participants making false and truthful responses with different modes of thinking.

Results: ERP effects were found in different brain areas and in different temporal intervals ($p < 0, 05$).

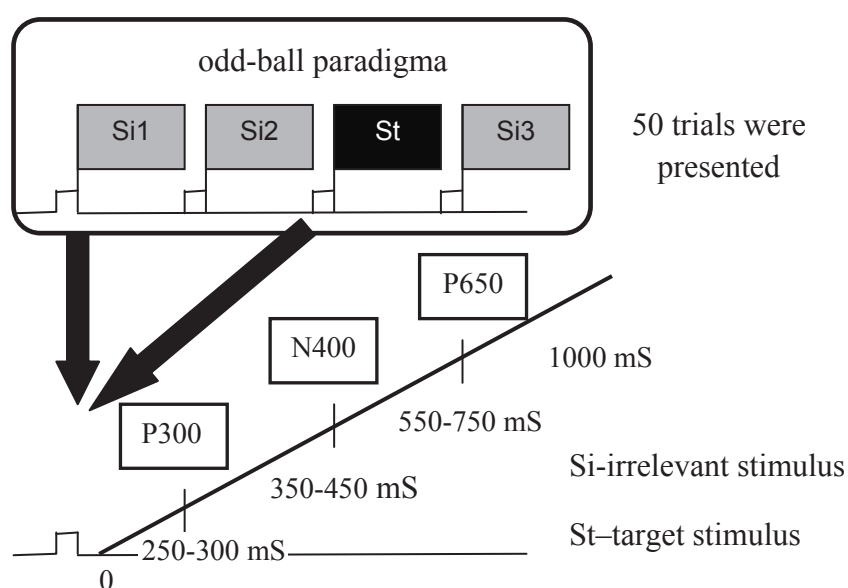


Figure 1. The research scheme

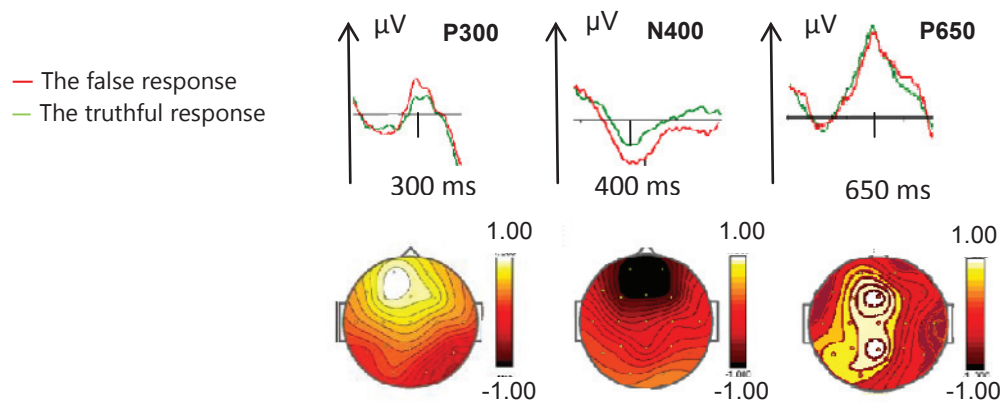


Figure 2. Cortical patterns of deception

It has allowed us to create the neurocognitive model of deception which is including next components: 1) Regulatory components (fronto-parietal attention network), 2) Perception of relevant stimulus (higher level of P300 wave amplitude in left frontal brain cortical region), 3) Processing of the perceived information (higher level of N400 wave amplitude in the region of Anterior Cingulate Cortex, a brain area that plays a vital role in cognitive control) and 4) Decision-making on realization of the false answer (Occurrence of the expressed late P650 wave in parietal cortical region) (Figure 2).

Also N400 wave latency during realization of false responses in the left and central frontal areas in participants with right-hand mode of thinking was significantly less, than in subjects with left-hand mode ($p \leq 0, 05$). P300 wave amplitude in the left frontal area in participants with left-hand and combined modes of thinking was significantly more in comparison with other participants of research ($p \leq 0, 05$).

Conclusion: Studies measuring ERPs in cognitive paradigm help to increase our understanding of the inter-relations between the cognitive and brain aspects of deception. The positive-negative-positive complex reflecting distinctions of ERP wave's amplitude and latency in various areas of brain cortex and in different hemispheres during realization of false and truthful responses is revealed.

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HETEROCHRONY OF EEG, COGNITIVE AND BEHAVIORAL ACTIVITY DURING DECREASED THE AROUSAL LEVEL CAUSED BY MONOTONY PERFORMANCE WITH CLOSED EYES

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Difficulty of designing devices monitoring the operator's arousal level in traffic and industry is related to complex dynamic pattern of physiological sleep/wake systems interaction in falling asleep as well as appearance of drowsy consciousness

states, complicating adequate wakefulness level self-assessment. The purpose of our investigation was to analyze the interaction dynamics between EEG sleep onset measures with mental and motoric measures of psychomotor activity performance during the arousal level decrease.

The previously developed psychomotor test (Dorokhov 1993–2000) was carried out as follows. Subjects sitting in a comfortable chair in a dimly lit room with their eyes closed had to mentally count 1-s intervals while alternately performing to series

of acts: 1) counting from one to ten simultaneously pressing a button, 2) counting from one to five not pressing the button, and so on. The monotony of the test caused the signs of drowsiness to appear as soon as within the first 5–15 min of the observation. Each experimental series lasted for 40–50 min, during which time a subject went to sleep and awakened several times. During the test we recorded: EEG (C3 and C4), horizontal eyes movements, skin galvanic response, subject's video and sound and the button presses. Subjects were 20 males with prominent EEG alpha activity.

It was showed that the correct test performance with precise number of pressings – 10 counts and pressing absence with temporal interval corresponding to 5 counts – was observed only during alpha activity predominance. Deviations from correct test performance in most cases were accompanied by appearance of drowsy and sleep EEG patterns. Insignificant activity disorders began during horizontal slow eyes movements emergence, distinctive for initial drowsiness stage – theta/delta EEG waves.

More considerable test performance disorders with correct count loss expressed in chaotic pressings of the button were accompanied by EEG sleep patterns appearance, distinctive for second stage of sleep: sleep spindles, sharp waves, K-complexes, delta waves.

This result with correct count loss but with persistent motoric component may be interpreted as indicator of drowsy consciousness state origin. In our opinion it is the origin of such consciousness state that causes car accidents, when driver considers himself still vigilant, but certain brain structures have already reached the second stage of sleep; it can be objectively registered by brain electric activity parameters. Consequently, the technological systems for arousal level monitoring should prevent a driver from getting into such a dangerous state when he is still able to automatically drive the car but his cognitive functions are damaged and adequate self-assessment is lost.

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ELECTROPHYSIOLOGY OF LINGUISTIC PERFORMANCE: EVIDENCE FOR A DOUBLE DISSOCIATION IN FLUENT AND NON-FLUENT APHASIA

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Background

Aphasia, a language impairment following stroke or brain trauma, is normally manifested behaviorally. Patients with the so-called non-fluent aphasia experience major difficulties at the level of morphosyntax (that is, producing and comprehending complex morphology and syntax). In contrast, patients with fluent aphasia predominantly show problems at the lexical-semantic level (that is, accessing word forms and lexical semantics). However, a few studies have proven that the language deficit in patients with aphasia is expressed not only in their linguistic performance, but also in specific electrophysiological responses.

In healthy individuals, incongruencies at different linguistic levels cause distinct event-related

brain potentials (ERPs) registered at the scalp. Syntactic incongruency elicits the ELAN and the P600 potentials, lexical-semantic incongruency elicits the N400 potential. Critically, in standard for those potentials linguistic contexts the lack of N400 was reported for fluent patients, while the lack of the ELAN and a reduced and delayed P600 – for non-fluent patients (Friederici et al. 1998, Wassenaar and Hagoort 2005). These findings support the idea of electrophysiological brain mapping on specific linguistic problems observed in different aphasia types.

Aims of the study

The study was aimed at further investigating electrophysiological evidence for the suggestion that spoken sentence comprehension problems in individuals with fluent and non-fluent aphasia are caused, at least partly, by breakdowns at different levels of language processing – lexical-semantic and morphosyntactic respectively. To test this, we performed a study in healthy and aphasic Russian individuals using the method of event-related potentials (ERPs) that has become a powerful tool in addressing temporal aspects of language processing.

First, we had to determine the normative markers of lexical-semantic and morphosyntactic processing

for Russian, since no similar ERP studies had ever been performed on that language. Second, in line with previous literature (Friederici et al., 1998), we hypothesized that fluent aphasic individuals should show the lack of the presumed marker of lexical-semantic integration difficulties (N400). Third, although there is no ERP evidence available for morphosyntactic processing in aphasia, in parallel with the lack of N400 for deficient lexical-semantic processing in individuals with fluent aphasia, we expected that individuals with non-fluent aphasia would show delayed or no presumed effects accompanying morphosyntactic incongruency (LAN or P600).

- | | | | |
|-----|---|----------|--|
| (1) | Dedushka | est | |
| | grandfather-NOM | eat-PRES | |
| | The grandfather is eating a meat pie. | | |
| (2) | Dedushka | est | |
| | grandfather-NOM | eat-PRES | |
| | *The grandfather is eating a meat axe. | | |
| (3) | Dedushka | est | |
| | grandfather-NOM | eat-PRES | |
| | *The grandfather is eating meat pies-LOC. | | |

Participants listened to auditorily presented sentences and had to judge them as correct or anomalous by pressing a corresponding button.

Results

Regarding semantically anomalous sentences compared with their correct counterparts, the group of healthy Russian individuals showed a standard marker of lexical-semantic integration difficulties – the N400 effect. This effect was found preserved in the non-fluent fluent aphasic group, but the fluent aphasic group showed the predicted lack of N400. Interestingly, a later positivity (P600) was found in both clinical groups in this condition.

The results concerning sentences with morphosyntactic errors revealed that this type of incongruency causes the P600 effect in healthy individuals, with no earlier negativity (LAN) that had been found before in other languages (Coulson et al. 1998). The same P600 effect was found in the fluent aphasic group. In contrast, in the non-fluent aphasic group morphosyntactic incongruency did not elicit the P600.

Conclusions

The findings support several important generalizations. First, ERP effects that normally accompany distinct levels of language processing can be selectively disrupted in different aphasia types in a double dissociation manner. The marker of lexical-semantic processing – N400 – was found missing in individuals with fluent aphasia, and preserved in those with non-fluent

Method

Sixteen individuals with aphasia (8 fluent and 8 non-fluent) and 8 healthy individuals, all native speakers of Russian, participated in the study. The materials included 40 Russian sentences, each in three experimental conditions: correct (1), semantically anomalous (2), and with a morphosyntactic error (3). Semantically anomalous sentences were constructed by replacing the direct object for a semantically inappropriate noun in their correct counterparts. Morphosyntactic errors were created by replacing the correct accusative case inflection for a different, unambiguously inappropriate, one.

pirog	s	mjasom.
pie-ACC	with	meat-INSTR
topor	s	mjasom.
axe-ACC	with	meat-INSTR
pirogah	s	mjasom.
pie-PL-LOC	with	meat-INSTR

aphasia. In contrast, the effect of morphosyntactic incongruency (P600) normative for the Russian language, was found missing in individuals with non-fluent aphasia and preserved in those with fluent aphasia. Second, the present electrophysiological data support a vast number of behavioral findings and provide extra evidence for the locus of the functional deficit in the two aphasic groups: in fluent aphasia it is of lexical-semantic nature, while in non-fluent aphasia morphosyntactic processing is more deficient. Lastly, the results shed light on language-related brain electrophysiology per se, since the P600 missing in the non-fluent aphasic group in the morphosyntactic condition was nevertheless found in semantically anomalous sentences (in the fluent aphasic group too). This suggests that the label “P600 effects” virtually covers functionally different responses that could be selectively disrupted in brain-damaged individuals.

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MUSICIANS' CROSS-MODAL INTEGRATION AND EXPERT MEMORY INVESTIGATED USING EYE TRACKING

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Musical sight-reading requires to process simultaneously multimodal information: visual, auditory, motor. Does the expertise in music rely on an efficient cross-modal integration? This talk investigates this issue with 2 experiments. In the first one, 30 expert and 31 non expert musicians were required to report whether two successively presented fragments of classical music were same or different. In half the conditions the participants received the fragments in visual presentation only (same modal presentation), in the other half they received the fragments in auditory and visual presentation (cross-modal presentation). As expected, analysis of Response Time and Errors showed that experts performed the task more accurately and rapidly than non experts, whatever the modal presentation, while non experts performed more accurately and rapidly in the same modal presentation. So, more experienced performers seem to be better able to transfer information from one modality to another.

In the second experiment, 64 participants, 26 expert and 38 non expert musicians were required also to report whether two successively auditory and visual presented fragments of classical music were same or different but in cross-modal presentation only. We manipulated cues in visual and auditory

modality to investigate whether a kind of expert memory with retrieval cues facilitates the detection of the note modification: an accent mark, emphasis placed on a particular note contributing to the prosody of a musical phrase and indicating a louder dynamic to apply to this note. This accent mark was put in a congruent or incongruent way, during the auditory and reading phases, on original or modified staves. We registered musicians' eye movements during the reading phase. As expected, the analysis of fixations and mistakes validated the hypothesis of modal independence for expert musicians, observed in the first experiment. Moreover analyses validated the cross-modal capacities of expert memory, using accent marks as retrieval cues. Results are discussed in terms of amodal memory for expert musicians that can be in support of theoretical work by Ericsson and Kintsch (1995)¹ more experienced performers better integrate knowledge across modalities using retrieval cues.

This kind of memory should be inscribed at the brain level due to its great plasticity and some cerebral structures might be associated. So, we will link these studies with recent research on multimodality and brain plasticity and expose project of further research by means of brain imagery technique (fMRI) to test whether musical expertise shares the same brain areas for audition, vision and motor processes.

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COMPOSITIONALITY, THE LANGUAGE OF THOUGHT, AND THE DYNAMIC MAP OF THOUGHT. NATURE AND PHENOMENOLOGY

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In this paper, I am going to present an argument against the language of thought hypothesis in the philosophy of cognitive science and briefly develop an alternative view, the dynamic map of thought hypothesis.

The language of thought hypothesis in the philosophy of cognitive science, mainly developed by Jerry Fodor (1975, 2008), is backed up by the following schematically reconstructed argument:

Compositionality (what accounts for productivity and systematicity) is a *sine qua non* requirement for thinking.

Only a formal language satisfies compositionality.

Therefore, the medium of thought is a formal language, the language of thought.

I argue that the second premise is flawed, in that there are other representational systems that satisfy compositionality, such as cartographical systems. This conceptual move against the language of thought hypothesis has been made in the literature by, *inter alia*, Braddon-Mitchell & Jackson 2008, who have discussed at more length the map of thought hypothesis.

I argue that Braddon-Mitchell & Jackson's static maps, although satisfying a form of compositionality, do not satisfy the form of compositionality that is at stake in the discussions about the medium of

thought. This is not a form of compositionality dovetailed to satisfy the strictures of formal language, as Fodor presupposes (see also Fodor 2007), but a more basic form of compositionality, of which the compositionality of formal languages is only a particular case.

I argue that only a dynamic map satisfies this more basic form of compositionality, by taking static maps concatenated as frames in a dynamic map as conceptual primitives and the rules of transition from one frame to another as rules of combining the conceptual primitives.

The dynamic map of thought hypothesis is a biologically more appropriate rendering of the nature of the medium of thought. By arguing that a dynamic map is compositional and compositional in the sense required by thinking, the inference to the conclusion is blocked and we are encountering a case of underdetermination in which I argue that the dynamic map of thought hypothesis has priority both ontologically and explanatorily over

the language of thought hypothesis, as it satisfies a more primitive form of compositionality.

I end by providing some details of a cartographical view of concepts corresponding to the dynamic map of thought hypothesis, resembling but not identical with the theory of mental files, and by liaising for compatibility purposes this view on thinking holding for the subpersonal level of cognitive systems with a view on the phenomenology of thinking holding for the personal level of cognitive systems, the theory of inferential and associative potentials. I also briefly sketch a view on phenomenological compositionality, corresponding to subpersonal compositionality.

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EEG CORRELATES OF MUSICAL CREATIVE ACTIVITY DEPENDING ON EMOTIONS INDUCED BY MAJOR OR MINOR MUSIC

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The study of psychological and psychophysiological mechanisms of the real, internally motivated creative process assumes a great importance. Music composing is an example of such spontaneous creative activity. The emotional power of music remains a mystery. And most people affirm that they feel strong emotions when they listen to music (Sloboda and O'Neill 2001).

Cognitive and emotional components are closely interconnected, interpenetrate each other in musical creative activity. The issue of emotional feelings to music is the object of a classic debate in psychology. Emotivists argue that emotions are really felt in response to music, whereas cognitivists believe that music is only representative of emotions (Roy et. al. 2009). Psychophysiological recordings of emotional feelings to music might help to resolve the debate, but past studies have failed to show clear and consistent differences between musical excerpts of different emotional valence.

Although the neural correlates of creativity are beginning to be understood, most studies use

laboratory measures of creativity and it is unclear how these measures are related to observable behaviors in the real world. Musicians are a particularly relevant population to study because of their intensive, long-term training that may have a significant impact on neural circuits that are associated with creativity (Gibson et. al. 2009). At the same time there is insufficient research devoted to brain correlates of musical creative activity depending on emotions induced by major or minor music. The problem of the brain organization of musical creative process depending on its emotional coloring remains unstudied.

The purpose of our experimental research was to reveal EEG-patterns of musical creative activity in musicians during internalized composing major or minor music.

The participants of empirical research were 47 conservatory students aged 17–23 with a specialization in “composition” and having an experience of composing music.

Procedure. EEG signals were recorded in a resting state (with eyes closed) and during three types of internal musical activity (perceiving, reproducing and composing music) from 21 scalp electrodes according to the International 10–20 System.

During the first functional test we asked the subjects to listen to a one-minute fragment of classical music of major emotional coloring (a fragment from Strauss's operetta "The Bat"). During the second functional test the participants were asked to reproduce mentally the heard musical fragment. During the third functional test the participants had to compose their own melody with the same emotional coloring as previously heard, and to reproduce (write or play) the composed melody after the research.

After a small break the same sequence of tests was carried out with a melody of minor emotional coloring (a musical fragment from E. Grieg's suite "Peer Gynt", the "Solveig Song").

For each functional test we analyzed spectral power and coherence of EEG for the following frequency bands: delta (0.50–4.00 Hz), theta (4.00–8.00 Hz), alpha (8.00–13.00 Hz), beta-1 (13.00–24.00 Hz), and beta-2 (24.00–35.00 Hz).

For statistical analysis we used 4-way ANOVA (Type of musical activity × Emotional coloring of a melody × Frequency band × Brain Cortex Area) and post hoc analysis to compare features of the frequency-spatial organization of cortical bio-potentials in musicians during creative and other kinds of musical activity and during composing major and minor music as well.

Results. As a result we have revealed the distinguishing characteristics of temporal and spatial EEG-patterns in musicians during all kinds of musical activities as compared with the resting state ($p \leq 0,05$) such as significantly higher level of delta rhythm power in left frontal (F7, F3) brain cortical area.

Composing music in comparison with other kinds of musical activity is characterized by a significantly higher level of delta power in the left posterior temporal brain cortical area (T5), where the acoustical associative brain regions are located which are connected with the mechanism of a rhythm perception and processing of complex musical characteristics (harmony, melody, rhythm) (Панюшева 2008).

Composing music is also characterized by an increase of short coherences between right

prefrontal (Fpz-Fp2), central (Cz-C4) cortical areas and left parietal (P3-Pz) brain areas at delta and theta frequency bands. A significantly higher level of beta-1 and beta-2 rhythm power in right prefrontal (Fp2, Fpz), frontal (F8) and left occipital (O1) brain cortical areas also accompanies musical creative activity in musicians. This EEG pattern is known as creative axis.

And at last we have revealed distinguishing characteristics of EEG-patterns in musicians during composing major and minor music ($p \leq 0,05$). Composing major music is accompanied by an increase of theta and beta-1 power in left anterior regions of brain cortex (F3, F7) and by an increase of short-distance left hemispheric low-frequency coherence as well. Composing minor music is accompanied by an increase of low-frequency power in right frontal and temporal brain cortical regions, on the one hand, and by an increase of mainly right hemispheric short distance low-frequency coherence and long-distance high-frequency connections, on the other hand.

Conclusions. On the basis of the received results next conclusions have been formulated:

1. These results show that short-distance low-frequency coherence connections and the high-frequency creative axis are most relevant for musical creative process.
2. Composing major and minor music is reflected in activity of anterior regions of the right and left hemispheres accordingly. The most difficult musical creative activity is reflected in high-frequency coherent connections.

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THE SEMANTIC FIELD "SOCIAL RELATIONS" IN MENTAL LEXICON OF KOMY-PERMYAK, TARTAR AND RUSSIAN SPEAKERS

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Nowadays it is impossible to study cognitive processes without studying mental lexicon structure. The mental lexicon 1) is the part of linguistic competence, and 2) is directly connected

with conceptual and categorical system of man; in a sense it is the overlapping of language and cognition. The structure of mental lexicon depends on the language that a person speaks and on his or her social background. In this regard it is very interesting to compare mental lexicons of different nationalities who speak different languages but live in one and the same region and belong to one and the same social group, because in that case certain territorial and social differentiations tend to minimize and the influence of such factors as language and ethnic factors can be observed.

Below paper compares the semantic field “Social relations” in mental lexicons of 3 ethnic groups that live in Perm Territory (West Urals): Komi-permyaks, Bashkirs and Russians. These national groups are the largest in Perm Territory and have been interacting on the territory of the region for several centuries.

We used the actual lexicon method offered by A.K. Agibalov (Агибалов 1995). Actual lexicon is the base part of the personal mental lexicon and represents the most frequent lexis of idiolexicon. Actual lexicon reflects the most vital for an individual and most significant in his mind conceptual classes (frames) and lexis that is connected with their denomination. The method of studying actual lexicon is the following: informants are asked to write a list of one hundred words which, in their opinion, they use in their speech most frequently.

The informants were the students of different universities of Perm: Komi-Permyaks (students of the Komi-Permyak department of Perm State Pedagogical University, 20 prs.), Bashkirs (students of different universities of Perm, 25 prs.), and Russians (students of Perm State University, 30 prs.). Each of these groups has its own specific character. Russian informants before the university lived in Perm or other cities of Perm Territory. Komi-Permyak informants lived in different regions of Komi-Permyak autonomous district – the part of Perm Territory. What is important is that the informants of these 2 groups had close contacts inside their groups (on the faculty or in a student group) during the experiment. The group of Bashkir informants is unique: identifying themselves as Bashkir, while having the Tartar as their native language. Furthermore they are students of different departments in different universities, but they were born in the same big village (Barda) and they socialize with each other when they are on holidays.

As a result of the survey 7487 responses have been collected from 75 informants (2994 in Russians, 1993 in Komi-Permyak, 2500 in Tartar). (Some

informants wrote fewer than one hundred words). Thus 3 lexicons (in Komi-Permyak, in Tartar, in Russian) have been formed.

The words of the field “Social relations” have been analyzed in the given material of mental lexicon. This field is one of the most important for any speaker and any society. The quantitative parameters of lexis of the field “Social relations” in Komi-Permyak, Tartar and Russian actual lexicons are presented in the Table 2.

The field “Social relations” includes words denoting all types of social functions of a person. This field may be divided into a number of smaller semantic groups. They are: “occupation”, “social status”, “social role” and “members of the same group”. (We compare not the words of different languages, but the meanings of these words.)

The words of the field “Social relations” are presented in Tartar lexicon more frequently than in Russian and Komi-Permyak ones, and the variety of different words is the greatest in Tartar lexicon too. The smallest occurrence of the words “Social relations” can be seen in Komi-Permyak actual lexicon (tabl. 1).

Semantic groups	Frame “Human”		
	Komi-Permyak (20 prs.)	Tartar (25 prs.)	Russian (30 prs.)
Occupation	8/4	31/16	26/9
Social status	—	13/11	15/11
Social role	1/1	12/3	3/2
Total	9/4	61/33	44/22

Table 1. Semantic groups of the field “Social relations” and their quantitative characteristics (total quantity of lexemes / quantity of different lexemes)

The qualitative analysis of the words of the semantic group “Occupation” shows that different meanings are represented in different vocabularies. The words common for all the students are the ones relating to their main occupation, i.e. studies – the words meaning “teacher”, “pupil” and “writer”.

The most frequent word of Tartar lexicon is *укытучы* “teacher” (8), in Russian lexicon it is the word *студенты* “students” (12). In Komi-permyak lexicon words *велотысь* “teacher” и *велотчись* “pupil” have equal rates (3). We believe that occurrence rates of these words prove that the Russian language consciousness focuses on itself while that of the Bashkir one focuses on man whose social status is higher.

The other words of the semantic group “occupation” are typical for each group of the informants. Russian students show further orientation on studying (words *поэт* “poet”,

стихонлет “rhymers”, *журналист* “pressman” are reactions of students of philological faculty). Only the word *проститутка* “prostitute” falls out of this row (only one informant named this word). Komi-permyaks only named one word *вӧралысь* “hunter” besides common words. Hunter is a traditional occupation of forest inhabitants, Komi being ones according to the social anthropology. Whereas Bashkir informants’ list of occupation is long enough. This fact proves evidently that their focus is on social relations.

The semantic group “Social status” is absent in Komi-permyak actual lexicon. In the Russian and Tartar languages words of this group practically don’t overlap. Only the words with the meaning “master” are common in both lexicons. We can observe the trend that was typical in the previous group “occupation” here: Russian students focus on their own personal environment (words *заочники* “correspondence student”, *классный руководитель* “class mistress”, *староста* “class monitor”, *зав. отделения* “head of department”) and on the negative perception of events (*террористы*, *шахбӧка* “terrorists”), but Bashkir students are more open to society.

In the semantic group “social role” all informants named the word with means “guest”: *гӧсьт* in Komi-permyak lexicon, *кунак* in Tartar lexicon and *гости* in Russian one. Besides that Tartar lexicon includes words *аңгәмәче* “interlocutor” и *юлдаш* “traveller”.

Only in Tartar actual lexicon there is the subframe “members of the same group”. It contains words *ватандаш* “compatriot”, *якташ* “fellow-countryman”, *сыйныфташ* “classmate”. The presence of these words in Tartar actual lexicon emphasizes again that social identity is very important for Bashkirs.

So, the quantitative and qualitative analysis of actual lexicons shows that Bashkirs are more socially oriented. While the Russians are more likely oriented on themselves in a society than the society itself. In Komi-Permyak lexicon there is no clear evidence of the social focus.

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ENVIRONMENT FURNISHING STYLE AND ITS EFFECT ON HUMAN TIME PERCEPTION

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Background: Human time estimation processes are not only influenced by external factors such as stimulus properties (Block, 1982) but also influenced by internal factors such as mood (Gupta, & Khosla, 2006). Context is one of the components that humans consider on time estimation processes and they tend to overestimate time when the presented stimulus is more complex or more varied (Block, 1978). Understanding the underlying factors that contribute to customers’ time sense not only give insight to general time cognition process, may also result in practical benefits to commerce. For example pleasantness and comfortableness of the environment can manipulate affective states in customers which also effect subjective waiting duration for service (Baker, & Camelton, 1996). Furnishing of the environment may have impact on subjective estimation of waiting time. Customers of a bank who are provided with a news-board were more relaxed and overestimated time to a lesser

extend than when customers were not provided with a news-board (Katz et al,1991). Furnishing style might not be the component that effects perceived time duration, but the presence of entertainment item itself as a distractor might be the component (Pruyn, & Smidts, 2008). However, from previous studies it is not clear to what extend decoration pattern itself has an impact on subjective time estimation durations.

To what extend subjective experience of time is manipulated by the furnishing pattern of the environment is the scope of the study. Time assessment will be compared on well furnished environment from poor furnished ones on two different time durations. Overall, two different experiments were conducted in order to investigate the interaction between subjective affective states when exposing to different environments and time estimation processes. We expected to observe time estimation difference between two conditions that subjects to make overestimation in Poor Furnished conditions.

Experiment 1: Well furnished and poor furnished environment images were determined based on subjective assessment of 14 participants (7



Figure 1. Environments which are highest (7.71 out of 9) and lowest (3.36 out of 9) in rating.

males, 7 females). The criteria for “Well Furnished” were high quality furnitures, color coherence, presence of an artwork (e.g., sculpture or painting), and for “Poor furnished” were poor quality of furnitures, common incoherence in the environment, lack of aesthetics. 112 indoor images were depicting indoor environments created using interior design features of Sims2 game software (with 4 extension packages, Electronic Arts, 2006–2011). 56 of the indoor images were created according to “Poor furnished” criteria and 56 were created according to “Well Furnished” criteria. In both conditions, 28 of the 52 images were depicting a living room, and the other 28 were depicting a bedroom. From 28 images (out of 52 in both conditions), 14 was included the presence of an entertainment tool such as a TV or a music player. Before subjects rating the images, they skimmed each image without any assessment while their reaction time were being recorded. This was for familiarizing subjects with all the images and measuring their overall duration required to skim each image. Subjects rated the images during their second observation time on a 1 (poor furnished) –9 (well furnished) likert scale. The presentation order of the images were random during trials.

Result Exp 1: Regardless of the furnishing style, mean observation duration of each image were obtained and these values were standardized to z-score values. Only the images one sigma below and above mean were considered as a stimuli for time perception task (Exp 2). For the furnishing quality ratings (Figure 1), there was no significant effect of gender ($t(220) = -0.30524$, $p=0.76047$), environment difference (bedroom versus living room condition, $t(54) = 0.097153$, $p=0.33562$). However, ratings for the presence of entertainment object conditions were significantly lower than absent condition ($t(54) = 3.594$, $p=0.00070497$). 32 images were elected from the remaining ones and furnishing ratings

were highest 16 (“Well Furnished”) and lowest 16 (“Poor Furnished”).

Experiment 2: Subjective estimation of time were assessed with prospective time cognition task on 13 (6 males, 7 females) participants. In time perception task, subject were required to estimate presentation duration of each stimuli via verbally reporting in seconds. There were two duration conditions: random between 10000–15000 labeled as “Short”, and random between 20000–25000, labeled as “Long” presented randomly during trials. In additionally, subjects rated these images according to its furnishing quality (same with Exp 1) and experience of pleasantness for each 32 image on 1–9 likert scale. In here, we aimed to assess the relationship between environment conditions and affective states in time estimation processes. In additionally we aimed to manipulate time duration on subjective time perception.

Results Exp 2: Time estimation scores were obtained as a ratio of objective by subjective. So far, we could not observe any significant difference on time estimation scores between “Well Furnished” and “Poor Furnished” conditions ($t(15) = 1.1334$, $p=0.27484$). There was also no effect of time duration (whether objective time is short or long) on time estimation results ($t(15) = -1.6356$, $p=0.12272$). In additionally we could not find any significant difference between “Well Furnished” and “Poor Furnished” conditions ($t(15) = -2.0658$, $p=0.0565$) on furnishing quality and pleasantness assessment ($t(15) = 1.6834$, $p=0.113$). However, there was a positive relationship between pleasantness and furnishing quality assessment ($r=0.9985$, $N=32$, $p=0.0000$) and we confirm that furnishing quality of an environment has link with experience of pleasantness. In additionally in the study we observed a significant effect of gender on time estimation results ($f(1,56) = 15.41$, $p=0.0002$).

Discussion: We expected to observe human time perception difference due to furnishing style

of the environment however we could not observe this effect in our results so far. Subject number in Exp 2 is inadequate to observe difference between conditions. Until any presentation of the project, we will run at least 60 subjects. If still the results are not on the same side with the expectation, we will change the time estimation task. Probably, two interval forced choice task would lead to accurate results of human time estimation processes. However, if still we cannot obtain the expected results, all the experimental stimuli will be created with more professional interior design software and all the procedures of Exp 1 and 2 will be repeated.

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KANTIAN AESTHETIC SUBJECT AS A COGNITIVE-LOGICAL MACHINE IN THE MOMENT OF THE PERCEPTION OF BEAUTY

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Kant considers beauty as an event that occurs inside the borders of mind and remains there,

which means that beauty hasn't any physical existence in the world outside of it. This very allegation of Kant is the most radical subjective notion that has ever been proposed in the field of philosophical aesthetics up to his time; considering, up to Kant's time the role of the object in emerging beauty had never been vanished. All subjective theories of beauty, up to then, were, in any possible way, restricted to the subjective sense of pleasure which were, in turn, inspired by some quality existed in the beautiful object. This quality could be either the object's perfection, usefulness, or some other formal features like harmony or proportion.

But Kant, as a philosopher who is speaking from the heart of the stream of subjectification of beauty, manifests that beauty has not only anything to do with the existence of the object but also, as far as the pure beauty is concerned, any of the sensitive perceptions received from it. In the *Critique Of Judgment* (1987: 44), he manifests: "... any reference of presentations,

even of sensations, can be objective (in which case it signifies what is real [rather than formal]

in an empirical presentation); excepted is a reference to the feeling of pleasure and displeasure, this reference designates nothing whatsoever in the object, but here the subject feels himself, [namely] how he is affected by the presentation."

In other words, beauty, for Kant, is neither a quality in the object, nor a sense of a pleasure inspired by it. Instead, beauty is a very special and unique kind of feeling which emerges as a result of a logical relation occurred between the mind and its cognitive state. In other words, the perception of beauty is an event which takes place when the subject's mind is its cognitive state.

A cognitive state of mind, or in Kantian terminology, a 'cognition in general' state of mind is the mind's fundamental state of cognition and has three major elements: The faculty of imagination, the faculty of understanding and finally the 'transcendental logic' as a fundamental procedure which determines the forms of the relation, takes place between these two cognitive faculties of mind. In every single process of cognition, the faculty of imagination, as the unconscious faculty of mind which contains representations, as a pile of content-free, spatio-temporal forms, without any logical relation between them, (let's say the p's), comes into relation with the faculty of understanding which contains the concepts (let's say the q's) on the very basis of transcendental logic. As the result of this connection, the proposition 'p is q' is formulated, which is a unit of cognition and an instantiation of the relationship between the two cognitive faculties of the mind at the same time.

In the case of perceiving beauty, as Kant insists, the purpose of the mental faculties is not to giving rise to any knowledge of the object. Rather, they are considering the object according to the feeling of the pleasure or pain it generates in the subject's mind and they are about to refer the representation of the object to the subject and the way it makes him feel.

Accordingly, they are, now, free of their cognitive duty and act purposelessly, namely they connect to each other freely, or in Kant's words, they enter in to a free play with each other and as the result, they formulate the proposition 'P is Beautiful' in which the P is the object's spatio-temporal form and the predicate, beautiful, is a feeling of pleasure. In order to distinguish the pleasure of beauty from the other pleasures, Kant adopts a negative approach; that is, he asserts that the judgment of beauty must be formed in an attitude devoid of all subject's interests, knowledge and historical background. This condition means that the object of judgment is neither the object of sensory pleasure nor the object of any outer purposiveness. After determining the attitude of the subject of judgment, Kant turns to the positive aspects of this judgment. He regards the object's purposiveness of form, which is, itself, a mind-made image, as the object of the judgments of pure beauty. This is the spatio-temporal mind-made image which stimulates the mental faculties into a free play. This free play, in its turn, brings about the sense of pleasure, and this is the very pleasure which attaches to the representation of the object by reflective judgment of 'P is Beautiful'. And this is the point where we judge something as beautiful.

On the basis of the explanations introduced above, we can come to the fact that the perception of beauty is a mental action which the subject, its will and its conscious background have not any determining role in. Judging the beautiful and the pleasure accompanies it, are involuntary mental events; And this would be more significant if we notice that the Kantian subject is a mere logical structured subject. As a matter of the fact that

some critics of him, like Nietzsche and Freud, have stated that the Kantian subject is a logical subject which has been generalized to the acting, thinking and finally aesthetic subject by him; Regarding a) the Kant's definition of the humane subject as something that can only be considered as the subject of a logical proposition and never as its predicate, as long as all the possible humane actions can be referred to, consequently he is ignorant of any other conditions under which this logical pre-eminence may belong to anything else. (Caygill, 2000); And b) regarding his notion of the transcendental logic which determines every single process takes place in the borders of mind; I believe that there could not be any generalization of the logical subject to the other kinds of it at all; Because it has not been possible for him to think of any other kinds of subject out of a logical scope.

Thus, In the case of perception of beauty, this logical structured subject is subjected to the function of his cognitive faculties which, in turn, are passively stimulated in to a free play just like the cogwheels of a machine. And the feeling, as a bold border between a human being and a machine has not any determining role in the whole story; because Kant insists that the feeling of pleasure is not a determiner but is just a consequence of the whole process. This is the significant point which, I see, makes a cognitive-logical machine out of the Kantian aesthetic subject.

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DIFFERENCES IN THE INTRINSIC TEMPO OF LANGUAGES

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Introduction

The question whether languages differ in their intrinsic tempo is attracting great interest. Is it only an impression that "speakers of some languages seem to rattle away at high speed like machine-guns, while other languages sound rather slow and plodding"? (Roach 1998: 150) Or is there really something in the language structure itself that makes some languages sound faster? And if so: How to measure this "basic" or "intrinsic" tempo of languages, abstracting from the enormous

inter-individual and situation dependent variation in speech rate, and from its variation depending on age, gender, education, etc.

In Fenk-Oczlon and Fenk (2010) we suggested and applied the simple metric "syllables per intonation unit" in order to analyze and compare languages with respect to their intrinsic tempo, a metric that does without any measuring of duration.

Method: Experimental, using parallel texts, and computing cross-linguistic correlations

Native speakers of 51 languages from all continents (19 Indo-European, 32 Non-Indo-European) were asked to translate 22 simple declarative sentences (German or English) encoding one proposition in one intonation unit, to read their translations in normal speech and to count

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A PERSONAL SEMANTIC MODEL-ORIENTED INFORMATION RETRIEVAL SYSTEM

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One of the central semantic insights in cognitive linguistics is that in addition to being related to each other by completely general relations such as hyponymy and meronymy, our concepts are also organised into *frames*, that is, concept-groups jointly providing a conceptualisation of a generic situation type. In addition to linking situation-types to expressions, the linguistic description of a frame also includes the characterisation of the potential participants of the conceptualised situation type. Consequently, if an expression occurring in a text can be interpreted with the help of a suitable frame, then the identification of frame elements makes it possible to construct the concrete situation described.

In our contribution we report on a domain-specific semantic search engine we are developing, which uses the above sketched frame-semantic method of interpretation to find text fragments matching the query specified by the user. In contrast to other semantic search systems, we place a special emphasis on bringing into play the user's semantic competence in the form of enabling her to modify the used semantic resources according to her own personal semantic model, which may be specific to a specific query.

On the most abstract level, the central steps of the operation of the search engine can be described as follows: Firstly, the user specifies a query that is not a Boolean combination of terms (keywords), but a series of well-formed sentences of a controlled language. The search engine searches for phrases in the documents having the same meaning as some sentences of the query. The relevance of the results depends on the measure of fit between the meaning of the query and that of the phrases found in the document.

In a bit more detail, the search process comprises the following steps: (i) a semantic representation

of the query is generated, (ii) a keyword-based preliminary search selects candidates for matching, (iii) the candidate segments are semantically parsed, where the parsing process is driven by the query representation (generated in step [i]), and, finally, the relevance of the segments to the query is determined.

The linguistic and shallow world knowledge used by the engine is represented in a semantic lexicon, which is based on frame-semantic principles both with respect to its structure and its content. In addition to serving as a theoretical basis, frame semantics also provides an important computational resource, the FrameNet database (Baker et al 1998), which contains a large collection of linguistic frame-descriptions. However, if a concrete user wishes to interpret a text according to her own personal semantic model, then the unmodified FrameNet database may prove to be inadequate for the task, since, on the one hand, it may contain frames that are not part of the user's intended semantic model, and lead to unintended interpretations, and, on the other hand, there could be frames in the intended personal model that are missing from the current FrameNet database. Therefore, we intend to extend the frame-semantic basis with the possibility of *personalising* the frame database. The user will be able to limit the frame database that is used for interpretation and it will be also possible for her to extend the database by adding special new frames in accordance to her own personal semantic model. In doing so, she will be able to utilize the frame-frame relations already used in FrameNet, e.g. she will also be able to define new frames standing in the *inheritance* or *subframe* relation to frames that are already defined.

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DIRECT SPEECH IN APHASIC DISCOURSE

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Introduction & Theoretical background

The purpose of this interdisciplinary, explorative study is to assess the occurrence of different types of direct speech constructions in the discourse of Dutch individuals with aphasia, an acquired language disorder following brain damage. It is assumed that direct speech has several benefits for aphasic speakers and will therefore be used frequently. The present study compares direct speech constructions in aphasic and healthy speech. In addition, the effects of the nature of the underlying disorder, in this case grammatical versus lexical, is examined.

Previous studies have shown that the relatively intact pragmatic (e.g., Hengst et al. 2005), conceptual (e.g., Goodwin 1995) and kinesic, prosodic, and paralinguistic (Wilkinson et al. 2010) resources of aphasic speakers enable them

to use direct *reported* speech. In the current study these findings were built on addressing the *multifunctional* use of direct speech in aphasic discourse. Individuals with Broca's aphasia, who have particular difficulty with grammar, can use direct speech constructions to get around grammatically complex constructions. Speakers with anomic aphasia, who have word finding problems, can benefit from direct speech constructions because they enable them to demonstrate abstract and complex matters such as thoughts, attitudes, and scenarios using concrete, operative, and familiar constructions: aspects that are known to contribute positively to word retrieval in aphasia (e.g., Nickels & Howard 1995).

In some cases, direct speech constructions represent former speech events (i.e. direct *reported* speech) and in other cases they are used to refer to thoughts, prototypical talk, hypothetical speech events etc.. Consider the following fragment, in which HK, a 36-year-old male non-brain-damaged speaker, tells the interviewer (INT) about his eldest son, who may start playing soccer soon. The direct speech items are presented in bold:

1. HK:	met een jaar of twee	within a year or two
2. INT:	dan mag je langs de lijn	then you may stand along the line
3. HK:	KOM OP!	COME ON!
4. INT:	((lacht))	((laughs))
5. HK:	BREK "M DE POAT" N!	BREAK HIS LEGS!
6. INT&HK:	((lachen))	((laugh))
7. INT:	dan krijg je rond 8 jaar dat papa	then around the age of 8 daddy's not
8.	niet meer mee mag	allowed to come any more
9. HK:	nee precies	no exactly
10. INT:	want die doet altijd zo raar	because he always behaves so strangely
11. HK:	ik ga op de fiets pa	I'll take the bike dad
12. INT:	ja ((lacht))	yes ((laughs))

Note that it is clear from the time frame explicitly established in line 1, "within a year or two", that the dialogue is an instantiation of a scenario that can plausibly take place in the future. Interestingly, HK does not use a reporting verb as a grammatical means of introducing the direct speech construction. Rather, he contextualizes it increasing the volume and shifting to another language (i.e. Frisian) in lines 3 and 5. He switches from addressing INT to fictively addressing his son. In line 10, INT *chimes in* (Couper-Kuhlen 1999: 12), using the same interactional strategy of shifting perspectives and presenting HK's son's hypothetical words. This shows that INT has no problem keeping track of the storyline and the distinction between the current and the "reported" speaker. Continuing in

the same demonstrative mode, in line 11 HK takes over again and completes SLT's turn, "quoting" his son and addressing himself. Presenting this stretch of talk as a first person dialogue rather than a third person report makes the narration more *vivid*, as has been observed by various researchers (e.g., Tannen 1986).

Methods

61 transcripts of individuals with aphasia (n=30) and 146 transcripts of non-brain-damaged speakers (n=88) were analyzed. Addressing the question of how the forms and frequencies of direct speech constructions differ across tasks and subgroups (anomic vs. Broca), the relative frequencies of these constructions in the speech samples were determined. Based on the patterns found in the

data, different forms of the construction type were distinguished, categorized and compared within and between the subgroups.

Results & Conclusions

Even though both the aphasic individuals and the non-brain-damaged speakers used various forms of direct speech, frequencies and distributions over categories varied across tasks and subgroups. The aphasic speakers produced significantly more direct-speech-constructions than the control speakers. In general, subjects with Broca's aphasia had a preference for quotations *without* a reporting verb, whereas the individuals with anomic aphasia mainly produced instances of direct speech *with* a reporting verb. A possible explanation for the difference between the frequencies of use by the aphasic speakers on the one hand and the healthy speakers on the other is the *strategic* use of direct speech by aphasic speakers to get around grammatical problems and word finding difficulties. In general, direct speech constructions are grammatically less complex and involve more high frequency words than indirect speech constructions. The dissimilarities between the aphasic subgroups

can be explained by the differences in grammatical complexity between subtypes of direct speech.

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ACADEMIC READING IN COGNITIVE SCIENCE

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Academic reading is one of the most important academic skills for new-coming students of interdisciplinary research domains as Cognitive Sciences or Media Studies. Successful academic readers have to develop particular reading skills and metacognitive strategies to combine deep understanding, critical examination, memorization, and speed reading (Locke et al. 2010).

But how is it possible to extract knowledge from textbooks of very heterogeneous fields ranging from neurobiology, computer science, linguistics, psychology to skills in cognitive modelling, experimental design, and data analysis in a motivating and effective way (Von Eckardt 2001)? Students of the Cognitive (Mind and Brain Sciences) have to be trained both in individual homework assignments and in small-group reading to develop suitable reading techniques to build

scaffolds that support interdisciplinary knowledge acquisition and knowledge transfer.

Within the teaching project „Docendo discimus“ at Studiumplus, part of ZESKO, Centre of Languages and Key Competencies at the University Potsdam, Germany (http://www.uni-potsdam.de/studiumplus/studiumplus_archiv_docendo%20discimus.html) we developed a course program for student tutors who independently taught the acquired reading strategies to beginning fellow students in subsequent terms.

In a first stage of expansion a lecture series with associated training sessions was developed which included two additional important academic skills: (1) information literacy and (2) academic writing. In combination with a series of didactic workshops and web-resources this training program for prospective student tutors has become firmly established at ZESKO and is widely used by university departments.

In a second stage of expansion a web-based tutorial will be integrated into the training program which allows for a greater extent of self-paced learning in the student tutorials and for students refreshing their knowledge and skills during exam preparation.

We will discuss learning outcomes and satisfaction collected by an online learning diary (<http://www.uni-potsdam.de/db/Lerntagebuch/lrb/>) and present suggestions for a structured program of academic reading skills in Cognitive Science, which will support theoretical integration of the involved scientific domains (Haack et al. 2010).

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FACTORS OF REDUCTION OF MONEY ILLUSION

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Money illusion (later MI) is a tendency to perceive the nominal value of money and not their real monetary values. The term was first introduced by Fisher (Fisher, 1928).

In theory of economic, the phenomenon of MI was rejected by scientists-economists for a long enough time. However, with the gradual spread of behavioral economics, based on experimental studies, the situation changed. Now phenomenon of MI in academic science and practice is seen as a very real fact of human behavior.

Economists explain the manifestation of the MI by:

- The low level of financial literacy;
- The sedation (price stickiness) of nominal prices on a range of products and services.

But, in reality, it is impossible to explain the MI only by the economic mechanisms, and so the studies of MI go mostly to the mainstream of psychology.

The first description of the MI psychological mechanisms gave Eldar Shafir, Peter Diamond and Amos Tversky 1997. They explain the MI by the existence of frame effect in the subject perception. Economic transactions in the subject perception may be either nominal or real terms. The nominal presentation is more simple and sufficient for short term (in case of absence of hyperinflation), but the presentation in real terms fix the true value of transactions. Consequently, the transaction is often a mixture of nominal and real estimation that give rise MI. As a result a psychological point of view MI becomes a irrational unconscious cognitive phenomenon of consumer's economic behavior. And, if Fisher suggested that the decrease or absence of inflation can overcome the MI, the psychological studies show that its regulation comes down to the psychological constructs.

Raghubir, P., & Srivastava, J. in 2002 studied the different consumer behavior of the U.S. citizens in

Canada and the UK, although they are aware of the exchange rates. The results of their research proves that people tend to unspent, if foreign exchange rate is significantly lower and overspent, if the foreign exchange rate is significantly higher than the rate of their own country. The authors modeled the role of time pressure and experience in the regulation of money illusion. Gamble, A., Garling, T., Charlton, J.P. & Ranyard in 2002 appears that MI was weaker or absent for essential high-price goods or services. The “emotional attachment to currencies” and “the level of gains and losses” as cognitive and emotional factors affecting the perception of the exchange rate has studied by Tyszka T. & Przybyszewski K., 2006.

The interesting in the all reviewed research is that there are studied the external factors of perception of money, or the general laws of mental perception, but in doing so they do not offer the ways or methods to overcome or reduce the MI and adequate perception of the exchange rate (except the experience).

We tried to find the other factors of regulation of the MI. As a measurement of MI, we established the willingness to buy products at discounts, offered by the entity in national currency (AMD) and often used in Armenia foreign currency (USD). MI coefficient was calculated by the suggested average price as a percentage of USD/AMD division.

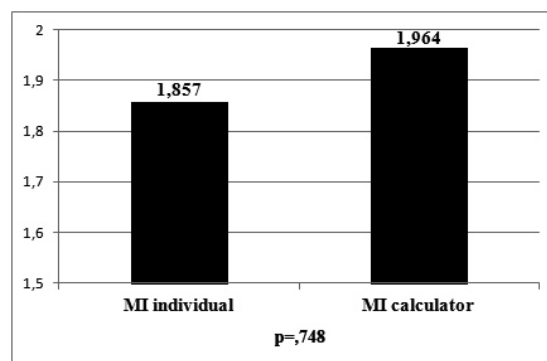


Fig. 1 Results of manifestation of MI before and after use of the calculator

In the Study 1, we tried to establish the effect of the use of computational tools (the calculator) to change the level of MI. The results of the Study 1 (Fig. 1) did not show statistically significant difference between the MI without calculator ($M=1.857$) and MI with calculator ($M=1.964$); $p=.748$.

The results allowed concluding that MI, after the use of the computational tool, did not change and it is a more stable phenomenon. Afterwards, we tried to find the other regulators of MI and put forward another hypothesis: the changes of MI may occur in communication, more specifically, discussion in pairs (Study 2). The results of the Study 2 (Fig. 2) show a statistically significant difference between the MI ind. ($M=1.76$) and MI com. ($M=1.38$) $p=.001$.

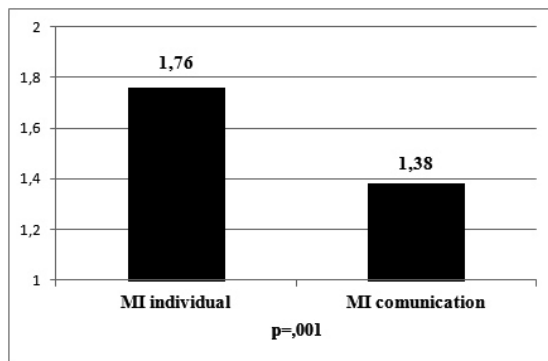


Fig. 2 Results of manifestation of MI before and after discussion in pairs

We also tried to make known the dependence of different changes of the MI in decision making styles in system of MBTI. ANOVA analysis revealed the MI com./MI ind. (Fig. 3) average difference in the styles NT and SJ (1.08; $p=.000$), NF and SJ (1.02; $p=.000$).

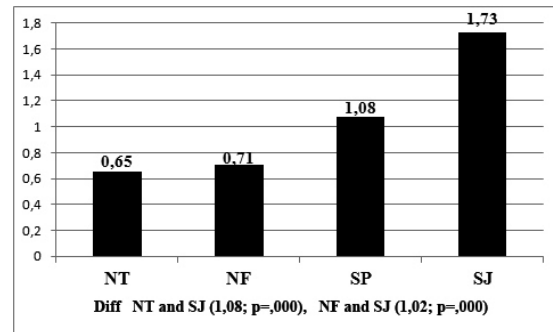


Fig. 3 Results of changing of the MI coefficient in respondents with different DM styles

Thus, the decision-making style NT and NF can be considered more prone to reduce MI in communication (discussion in pairs). In the system of the MBTI difference between S and N can be considered as the method by which the information is collected (Nutt P., 1989). Factor N is characterized as a focus on identifying the various opportunities and relationships, rather than as work with the existing facts. Factor S is characterized by the desire to make maximum use of these five senses to understand what is really going around, especially for an accurate assessment of the situation. First of all, they are interested in practical experience and what is happening in the here and now.

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ON THE DIAGNOSTIC VALUE OF THE DISTRACTOR EFFECT

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A large body of experiments demonstrated that fixation durations are reliably prolonged by transient visual distractors presented in a gaze contingent manner (e.g. Lévy-Schoen, 1969;

Reingold & Stampe, 1999). Recent studies suggest that in active vision this distractor effect varies with attentional engagement, as operationalised by the saccadic amplitude previous to the affected fixation (Pannasch & Velichkovsky, 2009). Their results demonstrated that distracted fixations after short saccadic amplitudes were stronger prolonged than those following long saccades. Graupner, Pannasch, and Velichkovsky (2011) extended these results showing that also the following saccadic amplitude is related to distractor

processing in the same direction. However, these results were based on post-hoc classifications of single fixations. A more straight-forward way to approach differential effects is to directly compare influences of instructions (i.e. intraindividual differences) and personality based variations (i.e. interindividual differences), respectively.

Therefore, we conducted two experiments engaging subjects in image inspection in order to be able to answer questions about scene details afterwards. Both experiments consisted of two blocks (each dedicated to one of two instructions) whereby the concrete questions were asked after 10s of image inspection (e.g., “Were there more objects on the right than on the left side?” for spatial layout condition, or e.g., “Was there a red telephone in the image?” in the object recognition task). Subjects inspected 24 images in each block. In half of them visual distractors were presented gaze contingent every 7th fixation, with a fixation onset latency of 100ms and a distractor duration of 100ms. In Experiment 2 the same paradigm was employed again. Additionally, in order to investigate trait specific differences between subjects, three groups (high, medium, low) based on extraversion scores from the NEO-FFI questionnaire (Borkenau & Ostendorf, 2008) were tested.

Fixation durations were analysed considering three factors: Distractor (baseline vs. distractor), instruction (spatial layout vs. object recognition), and an additional post hoc variable fixation content (on background vs. on object). The results on intraindividual, task based differences showed a clear pattern: All main effects reached significance level, revealing longer fixation durations for distractor presentation, in the object recognition condition and when fixating on an object, respectively. Interestingly, the only significant interaction of distractor x instruction unveils that the instruction based difference is exclusively based on the trials containing distractors. Preliminary analyses of Experiment 2 replicated results from Experiment 1. Additionally, interindividual differences seem to be restricted to the object recognition condition.

In summary, the results demonstrate diagnostic potentials of the distractor effect. While earlier

studies of task influences on fixation durations resulted in mixed evidence (see e.g. Castelano, Mack, & Henderson, 2009; Nuthmann, Smith, Engbert, & Henderson, 2010), we obtained a clear separation triggered by visual distractors. From that we conclude that the processes involved in scene layout interpretation vs. object recognition are differentially affected or disturbed by additional distractor presentations. Insofar, the distractor effect paradigm can be understood as a litmus test for intrafixational processes. By systematically disturbing functional fractions of fixations, a new avenue for understanding visual processing is opened. Combining our approach with brain imaging methods will allow going beyond purely behavioral findings by investigating involved brain mechanisms and their interaction during the process of visual activity. The results from Experiment 2 additionally underpin the idea of systematic analyses of interindividual differences in research on perception, attention, and especially on eye movements.

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LITTLE WORDS WITH BIG MEANING: INTERJECTIONS' USE IN APHASIC CONVERSATION

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Aphasia is an acquired language disorder caused by focal brain injury. It predicts specific patterns of language comprehension and production that affect the lexical retrieval and grammar of persons with aphasia (PWA). The linguistic impairment of the PWA increases the number and extent of breakdowns and decreases the fluency of speech. Both make the conveyance of information in talk more effortful for both the speaker and the recipient of talk. Aphasia not only affects the communicative ability of the PWA, but furthermore constitutes an issue of identity [1]. Interjections such as 'yeah', 'oh' and 'well' are an important resource to facilitate the comprehension and production of talk. They enable the participants to interpret and anticipate sequences of conversation more easily and correctly [2], which makes conversation more efficient and enhances the degree of intersubjectivity.

Research has uncovered two important features of interjections, which are essential to the organization of turn-taking in typical conversation, namely a 'syntactic' and 'pragmatic projectability' [3]. Structurally, interjections facilitate the organization of conversations in that the PWA may employ them to either assume or maintain speaker role or to align with hearer role. In this respect, interjections may serve as placeholders signaling the intention to continue with a full turn at talk. In contrast, when employed as backchannels, they function to decline speakership and request the interlocutor to continue. Pragmatically, interjections aid in the establishment of common ground. They indicate various attitudes that range "from relative indifference to enthusiast interest" [4], while they are being produced with ease and without syntactic constraints. Through

their lexical brevity and simplicity they are of great interest in aphasia, especially since they are generally spared [5].

Two conversations between a PWA and his spouse were analyzed to investigate the function of interjections. In contrast to prior research that related the use of interjections to passive communicators [6], results suggested that interjections can display passive speakers as active participants in conversation. Through interjections the PWA may determine speaker change, which enables him to better prepare contributions to talk and to thereby channel his resources. Further, interjections serve to express degrees of interest and engagement in a conversation. They alone may be perceived as a sufficient contribution to the conversation to display the PWA as competent conversation partner. This ensures a smooth conversation independent of the actual contribution by the PWA. Despite the multiple meanings of interjections, they nevertheless enabled the PWA to get his message across. In sum, interjections are suggested to serve as a remedy to threats to saving face.

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A STUDY OF LIMITS TO LINGUISTIC ITERATION. THEIR RELATIONSHIP TO SENSORIMOTOR COGNITION AND TO THE FUNCTION $f(Z) = Z^2 + C$

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Is has been generally accepted (see e.g. Hulst 2010) that the application of a given iterative rule

generates infinitely long sentences. However, in natural languages certain iterations exhibit anomalies that have not been properly studied yet. Among these anomalies there are limits preventing the addition of further admissible clauses to a given sentence. The next sections propose an experiment consisting in iterating intransitive verbs and datives.

The experiment

Let us consider context (1). Let us suppose that context (1) contains an infinitely long chain of embedded elements; among them, the following ones.

Context (1) [... a bank has a company that has an airplane that has a wing that has a spoiler that has a...].

The experiment consists in expressing the proposed embedded elements using intransitive

verbs and dative nouns in iterative sentences. Iterations are generated by rule (2).

Rule (2): $O \rightarrow \text{relative pronoun} + (\text{clitic}) + \text{verb} + \text{dative noun}$

Rule (2) generates sentences (3–5). Inadmissible segments are between brackets. Limits between admissible and inadmissible iteration are in bold face. Examples are in Spanish, since the distribution of its clitic *se* is a factor allowing verifying the accuracy of the results. In the examples *le* is a redundant dative pronoun.

- (3) El alerón le pertenece al ala que le pertenece al avión
The spoilerLE belongs to-the wing which LE belongs to-the airplane
que le pertenece la compañíaque le pertenece al banco.
which LE belongs to the company which LE belongs to-the bank
- (4) El alerón se le levanta al ala que se le levanta al **avión**
The spoilerSE LE rises up to-the wing which SE LE rises up to-the airplane
[* que se le levanta ala compañía que se le levanta al banco].
which SE LE rises up to the company which SE LE rises up to-the bank
- (5) [* El alerón vuela para el ala que vuelapara el] **avión** que vuela
The spoiler flies for the wing which flies for the airplane which flies
para la **compañía** [?que vuela para el banco].
for the company which flies for the bank

Discussion

Observe that the application of the iterative rule (2) behaves as expected in sentence (3), allowing infinite embedding starting from an element whose dimensions get closer to zero and finishing with an element whose dimensions get closer to infinite. On the contrary, iteration in sentence (4) has a limit between zero and infinite: *avión*. Embedding elements to the right getting closer to infinite beyond this limit is not allowed, while embedding elements to the left getting closer to zero may continue indefinitely. Sentence (5) 's iteration is an interesting case. It stacks around the limit *avión*.

Sentences (3–5) represent patterns arising when repeating the proposed experiment with different verbs and contexts. The use of the Spanish *se* endorses the idea that for certain intransitive verbs there is a limit; beyond it iteration stops being the iteration it was. In Spanish every verb behaving according to sentence (5) 's pattern needs or allows the clitic *se* only within a limit but not beyond it. Observe that while in sentence (5) the use of *se* was needed within a limit, in sentence (7) it is allowed also only within a limit.

(6) [... the face, the man, the family...]

(7) La cara (se) le cambia al **hombre** [*que se le cambia a la familia].

The face (SE) LE changes to-the man that SE LE changes to the family

The arising question is whether we can predict the distribution of the limits. They do not seem to

be related to semantic properties ([± animate] or [± human], for example) of the embedded elements, since elements of very different nature (airplane, company, man) may become a limit, as sentences (4), (5) and (7) show. In the same way, limits do not seem to be related to the verb's syntactic valences, since the same syntactic marriages are in some iterations admissible but in others, inadmissible. There are two possible alternative answers.

Hypothesis 1: Limits are probably related to which is perceived as a unit. Every element in the proposed contexts (1) and (6) participates in a part-whole relationship; there is, however, a difference (a limit) between elements of the same set and parts of the same unit. This hypothesis would be endorsed by Knott's 2011 work on sensorimotor cognition. Briefly, he differentiates *effector agents* or parts, *autonomous agents* or units, and *environments* or sets.

Hypothesis 2: The distribution of limits in patterns (3–5) exhibits a parallelism to the distribution of limits in the iterative two-variable function $f(Z) = Z^2 + C$, where Z is a variable representing two values (x and y) and C is a constant. The function's graphic representation is in figure (1) for an initial input $Z = (0, 0)$ and for a constant $C = (0.5, 0.5)$. Depending on the constant's value, the function exhibits three behavior patterns: (a) successive outputs approach infinity as figure (1) shows, (b) successive outputs inside a limit of 2 units radius approach zero, or (c) successive outputs

stack at an intermediate limit value between those initial values taking the function to infinite and those taking it to zero. It is not difficult to establish parallelisms between patterns (a-c) and the above proposed patterns (3–5). Function $f(Z)$ is involved in the definition of well-known fractal structures as Julia sets (Peitgen and Richter 1986) and the Mandelbrot 1982 set.

Conclusions

The distribution of limits to iteration under the proposed experiment's conditions is not directly related to linguistic parameters. From an interdisciplinary point of view, it seems to be

rather related to which perception considers sets, elements, units and parts, and to the behavior of the function $f(Z) = Z^2 + C$.

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A VALIDITY STUDY OF THE POTENTIAL FOR A SPECIFIC GAME ENVIRONMENT FOR TRAINING EMOTION REGULATION

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The EU project xDELIA (Xcellence in Decision-making through Enhanced Learning in Immersive Applications, www.xdelia.org) seeks to enhance the quality of investment decisions made by private investors. Investors' financial capabilities are believed to be correlated with their skills in managing their emotions; less skilful investors are more prone to emotional biases in decision-making, such as the disposition effect, i.e. selling stocks that have risen in value fast and holding on to losing stocks yielding a net loss (Shefrin & Statmanand, 1985), and hyperbolic discounting, i.e. valuing present wins over than delayed wins, even if the latter are bigger (Harris & Laibson, 2001).

The work presented here aims to validate a training game prototype that could later be used as a learning platform for training in emotion regulation by the investor group. Emotion regulation can occur in many ways, the two methods addressed in our current work concern emotional suppression (henceforth suppression) and cognitive reappraisal (henceforth reappraisal). Suppression is defined as “inhibiting ongoing emotion-expressive behavior” and reappraisal is “construing a potentially emotion-eliciting situation in nonemotional terms” (Gross, 1998). Reappraisal is commonly thought to be more effective and to have positive effects on wellbeing since it acts before the emotional response is elicited, while suppression acts after the emotional response is elicited and is associated with negative effect on wellbeing, impaired memory and is generally

less effective than reappraisal (Gross, 2003). Also, reappraisal appears to put less strain on cognitive resources, making them available for other task, thus improving task performance (Wallace et al., 2009)

Gameplay may be defined as *goal-directed and competitive activity conducted within a framework of agreed rules* (based upon Lindley, 2004). Serious games are games that are created or played for a specific purpose other than mere entertainment. The field of serious games has long sought a way to blend fun and education in order to improve learning. Such approaches have been taken by, e.g., Malone (1980) and Garris et al. (2002). Other approaches, such as simulation training, base the gameplay in a simulation environment. Pierfy (1977) did a meta-analysis of 22 studies where learning was better in three cases with games instead of conventional teaching, worse in three cases, and it did not make any difference in the remaining cases. Biofeedback has been shown to help with learning to influence blood pressure (Glasgow et al., 1982), pain (deCharms, 2008), and self-reported emotional responses (Allen et al., 2001).

Because of these successes with biofeedback, we have created a two-dimensional shooting game, named the Aiming Game (Cederholm et al., 2011), that utilizes biofeedback for training in emotion regulation. The biofeedback device used was the Emotiv EPOC™ (www.emotiv.com), a commercial EEG headset created for gaming applications. The goal of the Aiming Game is to acquire as many points as possible, which is achieved through shooting down black airplanes. There are also pink airplanes that act as distractors and that will cost the points if they are shot down. Every shot has a cost as well, so it is important for players to not waste shots. During play, the player's instantaneous excitement is

recorder using data from the EPOC™. This data is fed back into the game and used as a measure of player excitement, divided into five intensities. Before each game level the player is informed what intensity of excitement he or should aim for. The further away from the goal intensity they are, the harder the game gets, by manipulating two factors: the screen becomes increasingly blurry; and an aiming offset occurs, randomly misplacing the aiming crosshair every 0.5 seconds away from the mouse position. The misplacing radius grows bigger the further away from the goal excitement intensity the player is, encouraging the player to handle their emotions well in order to regulate their level of excitement

We have tested out the game with groups instructed to use methods of suppression, reappraisal and control (i.e. no instructions on how to handle emotions). These results indicated that subjects' tendencies toward emotion regulation strategies are correlated with game performance and will be described in detail later on.

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MODELS OF PLANNING IN COMPLEX RISKY DECISION MAKING

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Research into risky decision making has traditionally presented individuals with choice alternatives that provide an immediate reward or punishment based on the outcome of a single random event. Decisions are typically made in isolation, independent from any previous or subsequent choices. This approach neglects the complexity of everyday decision making. Many common tasks involve multiple interdependent choices and several uncertain events. For example, the university one chooses to attend will constrain the set of fields that one can later choose to study. The field one chooses to major in will in turn provide a unique set of options for further career development, and so on. Effective decision making in such cases requires that one consider which choices they are likely to make in the future before committing to an action at

present. Furthermore, complex real world decision scenarios, like career planning, involve various uncertain events that one cannot control.

We present recent work that extends the traditional risky decision making paradigm by incorporating some of the complexities of real world choices. Participants completed a series of multistage decision trials, represented as branching decision trees. At decision nodes (DNs), participants chose which path to take through the tree. At chance nodes (CNs), a marble was randomly drawn from an urn to determine the path. Our results show that people are capable of planning in multistage decision making. However, there were also sizable individual differences, with several distinct strategies emerging. A comparison of multiple competing models of how individuals incorporate factors like risk and degree of uncertainty when forming plans is used to elucidate the cognitive processes at work.

ACQUIZITION ACTIVITIES IN TEACHING READING IN FLT

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Nowadays English language teachers can choose among a wide variety of choosing methods and techniques for students acquiring a foreign language.

Since reading is the crucial skill for students in learning a foreign language, it is important to understand the principles standing behind these methods. The interactive model activities in teaching reading take into account the continuous interaction between text bottom –up and top-down processing. Efficient and effective reading entails both processes interacting simultaneously, in spite of the fact that today's instruction in teaching is strongly influenced by top-down processing perspectives. Teachers tend to teach these processes separately, at different stages. But what needs to be taught is not the one or the other, but the interaction between the two.

Two main approaches explain the nature of learning to read:

1) Bottom – up processing, so called because it focuses on developing the basic skill of decoding and understanding words, phrases and sentences in the text:

2) Top – down processing, which focuses on the background knowledge a reader uses to comprehend the text, (it is also associated with schema theory).

The traditional bottom – up approach to reading was influenced by behaviorist psychology of the 1950s. Language learning was characterized as a response system that humans acquire through automatic conditioning process. Behaviorism became the basis of the audio – lingual method which sought to form second language “habits” through drilling, repetition and error correction.

In the 1960s a paradigm shift occurred in the cognitive science. The new cognition theory represented the mind's innate capacity for learning, which gave new explanatory power to how humans acquired their first language. Meaningful learning occurs when new information is presented in a relevant context and is related to what the learner already knows. In 1960s and 1970s there was an explosion of teaching methods and activities that strongly considered the experience and knowledge of the Learner.

These new cognitive and top-down processing approaches revolutionized the conception of the

way students learn to read. In this view, reading is not just extracting meaning from a text, but a process of connecting information in the text with the knowledge the reader brings to the act of reading. Reading in this sense is a dialogue between the reader and the text.

Another cognitive theory closely related to the top-down processing also had a major effect on reading instruction. Schema theory describes in detail how the background knowledge of the learner interacts with the reading task and illustrates how a student's knowledge and previous experience with the world is crucial to decipher a text. The ability to use this schemata, or background knowledge, is fundamental for efficient comprehension to take place. Comprehension is the interaction between old and new information. To say that one has comprehended a text is to say that she has found a mental “home” for the information in the text, or that she has modified an existing mental home to accommodate that new information.

Schemata theorists make a distinction between text schemata (grammatical and cohesion structures), formal schemata (knowledge about the structure of a text) and content schemata (knowledge about the subject matter of the text) [1, p. 124–125]. Prior knowledge of content and formal schemata enables readers to predict events and meaning as well as to deduce meaning from a wider context.

Content schemata refers to the message of the text, and, if the topic is familiar, the reading task will be more productive and efficient.

Formal schemata (or genre schemata) refers to the way that texts differ from one another; for example, a reading text could be a letter to the editor, a scientific essay, or a work of fiction, and each genre will have a different structural organization. Knowledge of these genre structures can aid reading comprehension, as it gives a reader a basis for predicting what a text will be like.

The difficulties in comprehension may be attributed to the lack of background knowledge presumed by the text. Thus the responsibility of teachers is two-fold, on the one hand, to activate pre-existing schemata, on the other, to help students to integrate isolated knowledge into a schema or to build a new one.

Thus the following pre-teaching tasks are helpful:

1. *Selection of the texts.* To select texts that are relevant to the students' needs, preferences, individual differences and cultures. The goal is to provide meaningful texts, so the students understand the message, which entails activating

existing schemata and, helping build new schemata.

2. *Pre-reading, while-reading, and post-reading activities.* After selecting the text, the following three stages of activities are typically used to activate and build student's schemata: pre-reading, while-reading, and post-reading activities. Pre-reading activities are defined as devices for bridging the gap between the text's content and the readers' schemata. [2, pp. 138–151]. This is achieved by having students think, write, and discuss everything they know about the topic, employing techniques such as *prediction, previewing, semantic mapping, reconciled reading*.

There are the certain activities for developing fluency and efficiency in reading: extensive reading, reading rate, discourse knowledge.

- *Extensive reading* – reading individually and silently for the purpose of enjoyment. It is necessary to provide students with long reading selections for silent reading available to learners in and out of class.

- *Reading rate.* The use of timed and paced readings together with other activities that are done under time pressure may develop fast reading.

- *Discourse knowledge.* It is important to include exercises that train students in identification of textual features and the structure of different genres. Among the activities that can be used for this purpose are the uses of graphic representations

for text organization. This includes displaying cohesive devices, creating headings, unscrambling paragraphs and locating discourse markers that signal specific relationship, such as compare – contrast and cause- effect. The recognition of these discourse features requires advanced skills and training to identify them is essential.

The interactive model refers to the interaction between bottom-up and top-down processing skills. Bottom-up processing skills are not fully reflected in materials for reading, and the decoding aspect of reading is more often overlooked. To compensate for this deficiency, top-down tasks may easily be supplemented with bottom –up ones in the area of vocabulary development. Large recognition vocabulary is also developed due to numerous techniques of presenting the new vocabulary in a variety of ways: in topically related sets, in key words and/or key concept association tasks, in exercises to identify collocations, idioms, and through rules of word-formation. Thus, by enlarging vocabulary we can also build schemata in a parallel way, and while bottom-up processing becomes more automatic, higher level skills will become more engaged.

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CREATIVITY IN VISUAL ARTS: AN EMPIRICAL CASE STUDY

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Background: In a recent paper, Okada, Yokochi, Ishibashi and Ueda (2009) consider the evolution of artistic style and creativity in one of the coauthors of this study (Shinji Ogawa) over several years. One interesting point was how the artist hit upon an idea that led to a series of work: “[Shinji Ogawa] was a part-time teacher at a vocational-technical school of media art. When he was preparing for a class, he accidentally erased part of a picture on a computer screen by mistakenly pushing a keyboard button. At that moment, he came up with the idea that if something very important and valuable suddenly disappears, a new value may be generated and a new world could be created. With this idea, he tried to create a new movie poster for Roman Holiday by erasing the main actress, Audrey Hepburn, from the original poster. This was the beginning of the artwork series, ‘Without You’.” [p. 194].

Though the authors chose to interpret this example in terms of analogical modification, it resonates strongly with Piaget's account of how new schemas emerge through sensorimotor interactions with the environment. The example presented above bears a strong resemblance to Piaget's account of how a child brings a toy to her mouth in order to suck, accidentally notices the bright color of the toy and starts bringing toys near her face to look at them, eventually generalizing into a schema of ‘bringing objects to the face in order to look at them’ (Piaget 1977; 1962). In Mr. Ogawa's case, he accidentally discovered the operation of ‘delete figure from a picture’, realized artistic potential of it, and a new style of artwork was born. That the discovery was made accidentally is not so relevant for our argument here, but what we would like to emphasize is that the discovery resulted from the *application of a familiar operation (‘delete’) to a familiar object but in a novel way*.

Interestingly, similar episodes occurred later again in Mr. Ogawa's career. Okada *et al* note: “Mr. Ogawa happened to pick up a postcard at hand with

old Western scenery and drew a duplicate building next to an original one. Then he mailed it, as a postcard, to a gallery owner. When he heard from the gallery owner telling him that staff members of the gallery talked highly about his postcard, Mr. Ogawa decided to start a new artwork series, 'Perfect World', in which he duplicates a person or a thing in postcards or photographs of scenery." [p. 195]

The operations of 'delete' and 'duplicate' are quite similar. In the framework of Hofstadter (1995), one could say that one operation *slipped* into a neighboring operation to lead to another creative insight. Or one could see it in terms of a Piagetian *schema* of related operations that are applied to a *different class of objects*. It is important to underscore the 'different' part here. When handling photographs of famous landmarks, people, etc., we could change the contrast, brightness level, perhaps apply red-eye reduction tool, but we do not normally delete or duplicate objects, and much less so if the object is the main theme of the photograph. In other words, we could say that the creative insights resulted from applying a set of familiar operations to a set of [also familiar] objects that are not usually associated with the operations. (See, for instance, Gordon 1961.)

Focus of this paper: This paper is a collaborative effort between a cognitive scientist and a visual artist. In the last year or so, one of us (Shinji Ogawa) has conducted four different workshops with children – three in Japan and one in Poland – where children freely painted pictures on a given theme, and the artist then connected the pictures in a seamless continuum by painting intermediate scenes. We are going to focus on how these intermediate scenes were created. Using the introspection data from the artist, as well as observations on how each intermediate picture connects to the neighboring pictures, and how the style and content of one neighboring picture are morphed into another neighboring picture, we extract the underlying mechanisms and articulate a cognitive model of creativity for this process. This model is then related to Piaget's model of cognition and earlier models of creativity.

In particular, we will examine the role of perceptual attributes in this process of creativity. In our earlier work on creativity in metaphors, we have found that perceptual attributes can play a key role in the emergence of features in relating seemingly distant concepts (Indurkha *et al.* 2008). In this study, using numerous examples from the four workshops mentioned above, we analyze how perceptual attributes anchor conceptual associations, and propose a model for the emergence of new features.

A distinguishing aspect of our study is that it focuses on the process of *generating* a work of art rather than interpreting an existing work (Indurkha 2007).

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EYE TRACKING METHODS TO INVESTIGATE VERBAL AND NONVERBAL WORKING MEMORY

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Background. In the past 30 years working memory (WM) has become one of the central constructs in theories of cognition (Conway et al., 2005). Despite mounting research on WM within different fields, much is still debated about its nature and submechanisms. One of the controversies concerns domain specificity of WM capacity. Shah and Miyake (1996) espouse the idea of domain-specific WM resources, consider the processing domain to have the most influence on WM capacity, and, thus, deem WM dedicated to language to be separate from WM capacity for spatial processing. Baddeley’s famous triadic structural model of WM initially consisted of separate buffers responsible for storage of verbal and nonverbal information, however the model was later (2000) supplemented with an episodic buffer involved in storage of multimodal information. More recent theories of WM (Barrouillet, Cowan, Kane, Engle) roughly grouped under the umbrella term “attentional approaches to WM” regard WM as a domain-free capability determined by the general ability to allocate attention between two components of a given task, keeping relevant information activated despite possible ongoing interference. Kane, et al. (2004) likened WM capacity to the capacity of controlled attention. Cowan et al. (2005) consider WM to be an activated part of long-term memory that is currently in the focus of attention. Barrouillet et al. (2007) state that WM capacity is determined by the ability to rapidly shift attention between different representations. Mixed findings and as a result disagreement amongst researchers are partly due to the fact that various tasks have been used to index WM capacity (Conway et al., 2005).

Eye-tracking methods augur well for developing alternative WM tasks and measures. Their advantages include: reduction in reliance on comprehension of complex task instructions; use of natural language processing tasks; response

mode that requires no additional verbal, gestural or limb-motor responses; online processing measures that allow investigation of potential trade-off patterns between processing and storage as memory load increases (Ivanova & Hallowell, in press). Myriad studies show the applicability of using eye movements to index and to differentiate a wide variety of cognitive and linguistic processes (van Gompel et al., 2007). The aim of the current study was to develop and empirically validate a novel method to assess nonverbal WM capacity using eye movements and compare performance on this task to a verbal eye movement WM task.

Method. 34 healthy native speakers of Russian participated. Three WM tasks were administered. The modified listening span (MLS) task (Ivanova & Hallowell, in press) served as a comparison with the novel eye tracking tasks. In this task participants were asked to match short simple sentences to pictures in multiple-choice image arrays and also remember a separate set of words for subsequent recognition. In the verbal eye-movement working memory (EMWM) task (Ivanova & Hallowell, in press), the comprehension-processing component included four-picture multiple-choice arrays accompanied by a verbal stimulus (short active declarative sentences) corresponding to one of the pictures. Eleven most distinct colors were used as storage items. Multiple-choice arrays, each one followed by a display with an item to be remembered, were presented in sequences of 2 to 6 sets. At the end of each sequence a “recognition screen” with different combinations of colors in each quadrant was presented. Participants were instructed to look at the quadrant containing the colors they just saw. The novel nonverbal EMWM task differed from the verbal task in the processing component. Participants had to perform a visual search task (find the target image that varied slightly from the three identical foils rotated at different angles) and remember a set of colors for later recognition just like in the verbal EMWM task. Performance on the EMWM tasks was monitored solely via eye movements at 60 Hz using a remote pupil center/corneal reflection system. Mean proportion of fixation duration on target were used to index performance on the EMWM tasks.

Results. Correlational analyses demonstrated a significant relationship between the MLS task and the verbal EMWM task ($r(31) = .37, p = .035$) and the nonverbal EMWM task ($r(30) = .41, p = .019$). A strong relationship was observed between the storage scores of the two EMWM tasks ($r(29) = .82$,

$p < .01$) and moderate between the processing scores ($r(29) = .42, p = .018$). To explore trade-off patterns between processing and storage, we compared processing scores for items from sets size 2 and 3 (low memory load) to items from set size 5 and 6 (high memory load). No significant differences in processing scores were observed for verbal EMWM tasks ($t(32) = -1.53, p = .638$), while for the nonverbal EMWM task processing scores for the low memory load were significantly higher than for the high memory load conditions ($t(31) = 5.3, p < .001$). Storage scores from sets size 2 and 3 were significantly higher than storage scores from set size 5 and for both the verbal ($t(32) = 4.34, p < .001$) and the nonverbal EMWM tasks ($t(31) = 3.43, p = .002$).

Conclusions. Concurrent validity of a novel nonverbal EMWM task was established. Despite the distinct domains of the processing employed in the verbal and the nonverbal EMWM tasks, recall scores on the two tasks were highly related. These results favor models that consider WM capacity to be determined by various attentional mechanisms independent of the domain of processing (Barrouillet et al., 2007; Cowan et al., 2005; Kane et al., 2004). A consistent trade-off pattern was observed only for the nonverbal EMWM task suggesting that a common pool of resources for storage and processing was employed. Overall, the current study and our previous research show the feasibility of using eye tracking methods to reliably and validly index WM capacity. Use of eye movement tasks can be particularly advantageous when working with

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EXPERTISE REVERSAL IN LEARNING COMPLEX SKILLS

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There have been several rather counterintuitive phenomena observed in different fields of research that compared performance of experts and novices. Studies of cognitive load aspects of complex skill acquisition in technical and academic domains demonstrated that more experienced technical trainees or students may learn less than expected from instructions that are very effective for novices (expertise reversal effect). Studies of medical expertise demonstrated that less experienced medical students may in some situations outperform seasoned medical practitioners on recall of specific cases (intermediate effect). Finally, research in the execution of movements in sports showed that while novice players performed well under skill-focused and accuracy conditions, such conditions inhibited performance of experts who benefitted from speed conditions (explicit monitoring effect). Apparently, in each of those phenomena, there is a mechanism that disrupted successful expert performance while, at the same time, enhanced performance of less experienced individuals. This paper reviews the expertise reversal effects that have been found in the different fields and identifies their specific underlying mechanisms and common origins.

Most of us intuitively assume that experts always outperform non-experts because they are capable of coping with their tasks better. In instructional area, this belief in particular implies that if an instructional method or technique works well for novice learners, it should also work for more experienced learners or, at least, not have negative consequences for them. However, the available experimental evidence related to the expertise reversal effect indicates that this is not always the case (Kalyuga 2007). The relative deterioration in expert learners' performance may occur when there are overlaps between their well-learned and proceduralized knowledge structures and provided instructional guidance. The need to co-reference and integrate the already learned knowledge structures with presented information could impose additional unnecessary (extraneous) cognitive load (Sweller et al. 2011). Minimal guidance allows advanced learners to take advantage of their knowledge base in the most efficient way.

The instances of the effect have been found in a wide variety of instructional contexts with a large range of instructional materials in mathematics,

science, engineering, programming, accountancy, ESL, literature, management and social psychology. Participants ranged from primary school to university levels, in experiments that were designed as either longitudinal or cross-sectional studies with different groups of participants representing novice and expert learners. Thus, in technical and academic domains, the effect is sufficiently robust.

This paper also discusses some intriguing results in two other research domains related to expert-novice differences in medical expertise (Rikers et al. 2000) and the execution of movements in sport (Beilock et al. 2004) that indicated very similar patterns to those associated with the expertise reversal effect. It is suggested that these similarities might be due to deeper common mechanisms that disrupted expert performance while, at the same time, enhanced performance of non-experts. The established parallels could have important implications for research in cognition and instruction.

Firstly, such research needs more focus on learning new tasks that build on already proceduralized knowledge, in particular, the focus on the effect of using the spare working memory capacity (that becomes available through knowledge automation) on explicit monitoring and attentional control of well-learned components of complex skills. Secondly, another important research direction is the effects of concurrent reporting, self-explanations, and explicit monitoring of well-learned or automated components of a task on experts' performance and learning new components of the task. Thirdly, it would be useful to re-examine some earlier studies in Einstellung effect (a bias towards certain problem solving approaches caused by prior experience that may block the actual solution) from the suggested perspective of experts' learning and performance based on proceduralized and automated knowledge. Lastly, the factors influencing acquisition of flexible expertise need to be investigated. In medical expertise studies, such expertise is associated with the acquisition of general medical knowledge based on a generic illness script that includes interrelated consequences (symptoms, complaints), natural biomedical processes that cause them, and conditions that enable those processes. The intermediate effect might not be observed if experts in a different clinical domain are considered as sub-experts or intermediates when compared with experts in the main domain (Patel et al. 1990).

Within a cognitive load framework, the development of flexible expertise has been considered in relation to the acquisition of

generalized knowledge structures of medium level of generality (e.g., a Function-Process-Structure schema for technical objects) that are applicable in different specific areas in a domain (Kalyuga et al. 2010). The development of expertise in both medical and technical areas proceeds from the acquisition of declarative models explaining disease or technical objects in terms of general scientific knowledge to the encapsulation of this scientific knowledge into schemas for technical objects or illness scripts. From a cognitive load perspective, acquisition of specific content (including scientific knowledge) embedded in the framework of such generalized schemas may facilitate flexible problem solving skills by reducing levels of cognitive load involved in handling new problem situations.

In conclusion, the detailed investigation of the described implications of the expertise reversal

effect may allow different research fields to mutually enrich their theories, approaches, and empirical findings.

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FROM METAPHOR TO SPATIAL GRAM TO ASPECT. THE STORY OF THE ‘FIELD’ IN THE CIRCUM-BALTIC.

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A number of spatial grams that carry the sense of ‘out (of)’ in Finnic, Slavic and Baltic languages of the Circum-Baltic area appear to have their lexical origins in a similar source domain, namely, the area that is likely to be found outside of a house. While analyzing the motivations behind the grammaticalization paths in each language, I also argue that these kinds of language developments should be viewed not only from the semantic and morphosyntactic perspective: the role of language contact and the properties of the physical environment where a language is spoken should be taken into account as well. The research rests on the shoulders of previous etymological studies (Fraenkel 1962, Karulis 2001, Nilsson 1995), while drawing new data from a combination of visual stimuli based questionnaires and corpus material. The data is analyzed using quantitative multifactorial methods; a multidimensional scaling model in the vein of Croft and Poole (2008) will be used for the explication of the results.

The most interesting case in the language sample is that of the Finnic stem for ‘field’, *väli* (and also the semantically corresponding Latvian *lauks*, Lithuanian *laukas*), the grammaticalization of which has yielded spatial grams with the meaning of ‘out’ in Estonian, Võro, Livonian, Votic,

Latvian and Lithuanian; ‘in between’ in Finnish. In Estonian, the gram has further undergone the process of extension, becoming a semi-productive terminal aspect marker (likely under the influence of the historical superstrate language, German; cf. Hasselblatt 1990), while also functioning as an Aktionsart modifier in a number of more or less fixed phrasal verbs. In Võro and Votic, it has acquired the function of an actual productive perfective aspect marker. Other examples from the area yielding similar ‘out’ grams include ‘door’ (Võro), ‘window’ (Votic), ‘street’ (Russian, Votic) and ‘yard’ (Carelian, Polish). Similarly, in Finnish, the usage of for ‘field’, *pelto* (a Germanic loan), has extended into in a few metaphorical expressions that relate to removal or moving away – arguably showing potential for further grammaticalization (discussed, but unfortunately misinterpreted in Nilsson 1995).

This paper is based on a master’s thesis that is to be defended in June 2012, wherefore the research is in a state of work-in-process at the time of writing; questionnaire data on the usage contexts of the grams in Latvian, Lithuanian and Estonian is being gathered. Taking into account its complexity, special attention (in the form of a multifactorial corpus analysis) is paid to the grammaticalization paths and subsequent distribution of the Estonian ‘field’ (which has not yet been sufficiently explained in the literature). The other half of the paper focuses on the grammaticalization-fueled ‘out’ grams from

the same region, while drawing parallels with those in Selkup, Erzya, Northern Sami, Serbian, and Basque, discussed in the light of language contacts and possible nature-related motivations behind grammaticalization – the saliency of different types of landscapes in the native environment of each language.

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PARENTAL SUPPORT STRATEGY TOWARDS EARLY CONCEPTUAL DEVELOPMENT: ACQUISITION OF ADJECTIVES

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This paper deals with parental conversational / discourse strategies used in order to stimulate the early acquisition of semantic and morphology of adjectives. Since the adjective is considered one of the most complex and non-conceptual salient linguistic categories to acquire (e.g., Kamandulytė 2010, Voeikova 2011), we can hypothesize that parental (caregiver) support (spontaneous linguistic and / or communicative 'bootstrapping' elements) towards adjective acquisition is necessary and, consequently, linguistic input should be not only rich, but also well-structured in the flow of conversation.

The aim of this present study is to investigate and compare parental conversational strategies relative to early adjective acquisition in the morphologically rich Russian and Lithuanian languages.

The study is based on the longitudinal corpus data of a Russian boy and a Lithuanian girl. Both subjects are typically-developing monolingual children, similar in age (1;8–2;8), social characteristics and linguistic age (MLU development). The girl was recorded by her mother 2–3 times a week. The size of her corpus is 119958 words. It covers ~27 hours of the girl's dialogues with her parents. The boy was recorded by his grandmother in the same way. The size of his corpus is 140249 words. There were ~48 hours of the boy's conversations with his grandmother and parents. The transcribed corpus of conversations between the children and their parents was annotated for multipurpose automatic linguistic analysis, using tools of the program

CHILDES (Child Language Data Exchange System) (B. MacWhinney 1991)¹.

During the investigation, the *pragmatic* (metalinguistic / conversational reactions), *structural* (expansions, reformulations, corrections (direct / indirect), repetitions (pure / focus) etc.), communicative (statements, interrogatives, exclamations, requests) *positional* (initiative / reactive turns), and semantic features of caregiver utterances relative to the children's adjective production were analyzed. The methodology of pragmatic and structural analysis was proposed by W.U. Dressler and M. Kilani-Schoch (Dressler et al. 2006), and developed by the authors of this paper according to the specifics of Russian and Lithuanian child-directed speech (Kazakovskaya 2011, Kazakovskaya, Balčiūnienė 2011). Moreover, the additional criterion of *positive*, *negative* or *neutral* evidence of the adults' reaction was taken into consideration.

Here are some short but necessary comments regarding the methodology of our investigation. Metalinguistic reactions are related to the form of a child's previous utterances, whereas conversational ones are connected with their content. Repetitions can be described as echo-repetitions of the whole preceding phrase by the caregiver, while focuses are partial repetitions. Reformulations are adult rephrasing of what they think the child intended to say. Expansions occur when the child's phrase is lexically and grammatically supplemented by an adult. Indirect (implicit) corrections are adult indications that the form or content of the child's previous phrase was erroneous. Clarifications are

¹ The Lithuanian corpus was collected and morphologically coded by I. Balčiūnienė. The Russian corpus was collected and morphologically coded under the supervision of N. Gagarina. The syntax coding was carried out and has been checked twice by authors of this paper.

requests to repeat or clarify the previous phrase. Topic continuations occur when an adult does not respond explicitly to the child's phrase but continues a natural flow of conversation, while topic shifts occur when an adult does not respond explicitly to the child's phrase and changes the topic.

A qualitative analysis of the adult-child dialogues yields the following general results.

All parental support, both in Russian and Lithuanian, occurs at the stages of initiation (14% in Russian, 23% in Lithuanian) and reaction (86% in Russian, 77% in Lithuanian). Initiations can be described as adult attempts to elicit the child's adjective (e.g., parents use definite semantic types of question or ask a child to say a particular word), while reactions are typically special structural modifications (e.g., expansions, reformulations, direct / indirect corrections, pure / focus repetitions) of the child's previous adjectival utterance.

Both initial and reactive parental utterances can contain a target adjective or stimulate the autonomous production of an adjective. The Lithuanian caregiver tends to repeat the target adjective (83%), while the Russian one provides the autonomous adjective (63%).

Although in both corpora caregiver support includes all typical communicative types of utterances (i.e. in order to stimulate child's adjective production parents produce statements, questions, exclamations, and requests), interrogatives and statements are the most frequent types. However, interrogatives dominate in Russian (55%) and statements prevail in Lithuanian (55%).

The distribution of pragmatic turns revealed the dominance of conversational reactions towards the semantic of early adjectives (i.e. parents react to the content of the child's utterance), whereas metalinguistic reactions were mainly focused on the incorrect morphology (e.g., erroneous derivational forms, such as diminutive adjectives, synthetic comparatives and superlatives) and syntax (e.g., agreement errors or inappropriate word order).

Finally, preferred structural types of reaction to the child's adjective production were identified: expansions (29% in Russian, 31% in Lithuanian), pure repetitions (27% in Russian, 25% in Lithuanian), reformulations (14% in Russian, 14% in Lithuanian), corrections (12% in Russian, 13% in Lithuanian), focus repetitions (10% in Russian, 5% in Lithuanian), and clarifications (8% in Russian, 12% in Lithuanian).

Since both Russian and Lithuanian child-directed speech analysis displayed a great pragmatic, semantic, functional and structural variety of observed linguistic input, they can be described as rich and well-structured. Also, despite some cultural and individual differences in caregivers, the main features of their contribution seem to be similar or even identical, and this evidence could indicate a need for a general discussion of the universal aspects of parental conversational / discourse strategies related to early adjective acquisition.

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PROSODY AND LOCAL DISCOURSE STRUCTURE IN A POLYSYNTHETIC LANGUAGE

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As has been known since at least Chafe 1994, spoken language is produced in spurts, or quanta, or **elementary discourse units** (EDUs; see Kibrik and Podlesskaya 2009). EDUs are identified on the basis of prosodic criteria, such as tempo, loudness, intonation contours, pitch accents, and pausing. Cognitively, EDUs correspond to foci of consciousness (Chafe 1994).

Local discourse structure, consisting of EDUs, has been studied in a number of languages. In this paper I apply this approach to a polysynthetic language of Alaska, North America, called Upper Kuskokwim Athabaskan (UKA). Polysynthetic languages are those in which morphological complexity of the verb substantially exceeds cross-linguistic average. Much of what is encoded by function words of nominal morphology in other languages, is encoded in verbs of polysynthetic languages. As a result, polysynthetic verbs often consist of lengthy sequences of morphemes. One

typical aspect of polysynthetic languages is that clause arguments are encoded by pronominal affixes inside the verb. Whereas in a language like English the clause *She saw him* consists of three words, in a polysynthetic language it would be one word that can be schematically represented as *she-him-saw*. It is an interesting research question how these grammatical peculiarities relate to local discourse structure.

This study is based on a corpus of UKA discourses including several genres, such as personal stories, folk stories, conversations, interviews, etc. The overall length of UKA talk that was transcribed and served as the basis for this study is 3 hours 20 minutes.

The corpus of discourses has been divided into EDUs. This procedure did not meet with major difficulties. The familiar set of prosodic criteria (see above) worked for UKA successfully. For example, in the EDU shown in (1) the beginning of the clause (the noun) was pronounced by the speaker with the pace of 240 ms per syllable, and in the final part of the clause (the verb and the ensuing particle) the pace is 450 ms per syllable.

- (1) *sighwdla' todoltsitl' ts'e' 'My sled broke through ice'*
my.sled fell.through Particle

The validity of the familiar prosodic criteria is an important finding, because the technique of EDU identification was developed on the basis of European languages, whereas UKA is typologically as different from those as one can get. Therefore, it appears that EDUs constitute a basic building block of the on-line cognitive process of discourse production, independent of grammatical properties of individual languages. The number of EDUs obtained in the segmentation procedure is 965.

Language	Percentage of clausal EDUs
English (Chafe 1994)	60%
Mandarin (Iwasaki and Tao 1993)	39.8%
Sasak (Wouk 2008)	51.7%
Japanese (Matsumoto 2000)	68%
Russian (Kibrik and Podlesskaya 2009)	67.7%
Upper Kuskokwim Athabaskan	70.8%

Table 1. Proportion of clausal EDUs in Upper Kuskokwim Athabaskan and other languages

As is well known (Chafe 1994), EDUs generally tend to coincide with clauses. In UKA, the percentage of such coincidence is somewhat higher than in other languages studied so far, but it is within the same range. Table 1 shows the percentage of clausal EDUs in UKA in comparison with a number of other languages. The vast majority (84%) of UKA clausal EDUs are headed by an inflected verb, such as in (1). Much rarer are clauses headed by a verb of being (6%) or clauses lacking a verb at all (10%).

Apart from the bulk of canonical clausal EDUs, there are two kinds of deviations:

- short EDUs – those that are smaller in their propositional content than a clause (14.8%)
- long EDUs – those that contain more than one predicative element and thus are larger than a clause (14.4%).

Short EDUs further fall into several classes, as in other languages:

- regulatory: consisting of a discourse marker, such as a connector or an epistemic particle
- fragmentary: EDU that was started but not completed (false start)

- subclausal: prospective or retrospective increments, semantically belonging to a clause but prosodically isolated into a separate EDU; see example (2).

- (2) yats'ese di'isdiyok dine k'inodle ghoda
that's.why it.happened.to.me that time icon because.of
'That is why that happened to me then because of the icon'

Long EDUs primarily consist of combinations of a matrix clause and a complement:

- (3) hondenh ghwla' sidadza' yinezinh ts'e'
where unknown my.sister he.is.thinking Particle
'Where is my sister, he was thinking'

Much rarer are concatenations of coordinate clauses within one EDU, or relative clause constructions.

Generally, the stratification of EDUs in UKA is quite typical, judging by the data we have from better studied languages. Probably the most surprising fact is the equifrequency of short and long EDUs. For comparison, in the Russian corpus studied in Kibrik and Podlesskaya 2009, short EDUs strongly outnumber long EDUs: 26% vs. 6.3%. Most likely, this peculiarity of UKA is related to its polysynthetic character. If measured in the number of words, EDUs in a polysynthetic language are shorter: more information is packed in the inflected verb. As a result, more additional lexical elements fit inside an EDU. There are fewer regulatory and subclausal elements finding themselves outside an EDU, and more than one verb more often fits inside an EDU.

The profile of a language in the domain of local discourse structure thus depends on two major

factors: first, the universal, cognitively based requirements on discourse segmentation, and second, language-specific grammatical peculiarities of the language.

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NON-DISCRETE EFFECTS IN LANGUAGE, OR THE CRITIQUE OF PURE REASON 2

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Language is a hierarchical system. At each hierarchical level (phonology, grammar, discourse) units display a paradoxical behavior. They are segmental, and at the same time they somehow tend to avoid segmentation and merge. This can be seen in both paradigmatic and syntagmatic aspects. Consider the phonemic level. Paradigmatically, each language is typically believed to have a fixed set of phonemes. But all kinds of partial membership in this set are systematically found across languages, e.g. it is unclear whether one

must posit the difference between hard and soft /k/ and /k'/ in Russian. Syntagmatically, it is difficult to draw a clear boundary between segments in phonetic signal. For example, when pronouncing something like /ko/ labialization is found already when the consonant is pronounced.

In grammar, the neat distinction between words and affixes is hard to be drawn in any language. Elements such as English *the* or *to* are words by some criteria, and parts of larger words by other criteria. Linguists typically attempt to solve this problem by introducing an intermediate class of elements: “clitics”. But this actually complicates the problem even more, as now one has to draw two boundaries: between words and clitics and between clitics and affixes. At the level of discourse structure,

there is evidence that language is produced not as a steady flow but rather as a sequence of spurts, or “elementary discourse units”. These units can often be identified by prosodic criteria, but there is always a residue of complicated instances in which it remains unclear whether we see a combination of elementary discourse units merging together or, on the contrary, an unusually long but single unit.

There are multiple non-discrete effects in semantics, too. The well-known phenomenon of polysemy, found in most lexical items, resists discrete analysis as boundaries between different meanings of a word are blurred, and seemingly distinct meanings of a word can sometimes be realized simultaneously (see Zaliznjak 2006 for a detailed discussion).

Overall, it appears that language simultaneously longs for discrete, segmented structure and tries to avoid it. This problem is truly overwhelming in linguistics and is in the core of theoretical debates about language. Non-discrete effects permeate every single aspect of language. Two polar approaches to this problem are found. The dominant approach can be called discrete or digital, it suggests that language is underlyingly discrete whereas non-discrete effects only occur at the stage of realization and therefore are uninteresting. The digital approach is reductionist but it traditionally has an appeal of apparent scientific rigor.

The other approach, that can be dubbed analog, acknowledges non-discrete effects in language and, in trying to grasp them, has developed theoretical concepts such as prototypes in category membership. The analog approach is inclusive but repels some by picturing reality in an overly complex way. Among the many attempts in linguistics and in cognitive science to capture non-discrete effects consider e.g. Rosch 1973, Bell 1976, Lakoff and Núñez 2000, Linell 2005, Nikolaeva 2008. Varieties of the analog approach are very diverse and often keep struggling with the traditional opposition “discrete vs. continuous structure”. I propose that in the case of language we see the third kind of structure that can be called focal: focal phenomena (phonemes, meanings, etc.) are simultaneously distinct and related.

All this poses a question about the scientist’s inclination to see language as a discrete structure: is this inclination based on the objective properties of language or rather is a product of the observing human mind? This kind of question is not novel in the history of scientific thought. In fact, it is one of the main issues addressed in Kant’s *The Critique of Pure Reason*. Kant attempted to go beyond the debate between empiricists and dogmatists and suggested that the position of observer, or

cognizer, fundamentally affects the knowledge of the world. If language is a *Ding an sich*, according to Kant it must be unknowable. Only those things are knowable that are open to experience and correspond to our intuitive judgement. Of course, compared to physical world, in the case of language and other cognitive processes Kant’s problem is much more acute because mind here functions both as observer and object of observation, so making the distinction between the two may actually be impossible.

Standards of scientific thought have developed on the basis of physical, rather than cognitive, reality. Of course, physical reality is much more prone to the discrete approach. Just as we invoke scientific thinking, we tend to immediately turn to discrete analysis, and this is the reason why discrete linguistics is so popular, in spite of the omnipresence and obviousness of non-discrete effects. Much of science is about categorization of phenomena, and it is an extension of the general cognitive ability to categorize that is often associated with the left hemisphere functions, rationality, and discreteness. However, in the case of language and other cognitive processes we clearly see the limits of the traditional discrete approach. We need to develop a more embracing linguistics and cognitive science that address non-discrete phenomena not as exceptions or periphery of language and cognition but rather as their core.

I propose several avenues of research leading towards this goal. First, it makes sense to begin developing linguistic analysis from the kind of sound channel that is far less discrete than the verbal code, namely prosody. One example I consider is connected to the identification of the “period intonation” in speech (Kibrik 2008). This prosodic pattern means the movement of the speaker’s F0 towards the bottom of the speaker’s voice range. This definition inherently relies on a speaker’s characteristics, it cannot be formulated in more objective terms, such as a certain F0 value. Other prosodic examples are also considered, such as vowel length iconically representing physical or cognitive distance (Kodzasov 2009).

Second, another communication channel that is also essentially analog, is gesticulation accompanying speech. As was rightly pointed out by Tomasello (2008), in order to “understand how humans communicate with one another using a language <...> we must first understand how humans communicate with one another using natural gestures”. Gestures are typically classified into several kinds, including pointing gestures and iconic gestures. There are many instances in which one and the same gesture is simultaneously pointing

and iconic, e.g. when a speaker demonstrates the motion of vehicles, using a hand as a substitute of a vehicle and at the same time pointing in a certain direction with his or her fingers.

The third point is methodological. A lot of efforts were spent beginning from the 1960s trying to explain language mathematically as a discrete symbolic system. These efforts have largely failed, mostly because of the non-discreteness of many linguistic phenomena. It is time to think of alternative kinds of mathematics more appropriate to the nature of language. I describe a study of referential choice in discourse, in which the choice between full and reduced noun phrases is seen as not necessarily categorical, and methods of machine learning are used to model this process and assess probabilities of a certain referential option appearing in discourse. This last point demonstrates that not only non-verbal (prosodic and gestural) but also verbal devices can be explored, while acknowledging non-discrete effects in language.

It remains an open question if cognitive scientists are able to eventually overcome the strong bias towards traditional rationalism and discrete analysis, characteristic of scientific thought. This bias may be a cultural tradition or it may be

something deeply grounded in the human analytical mind. Anyway, it is worth trying to circumvent this bias and to seriously explore the focal, non-discrete structure that is in the very core of language and cognition.

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ON THE PRAGMATIC AND BIOLOGICAL NATURE OF LANGUAGE DYNAMICS

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This is part of LUIT (*Language, a Unified and Integrative Theory*, forthcoming, cf. Kirtchuk 2007). The dynamics of language involves diachrony but also, among others, ontogeny, phylogeny, creolistics and register variation; and not only grammar but first and foremost pragmatics. For instance: Pragmatic, intonative, morpho-syntactic, typological and psychological factors, show that more often than not, so-called proleptic utterances do not result from the extra-position of elements from sentences previously constructed. Terms such as *extra-position* and *dislocation* imply the precedence of syntax over pragmatics and over language's nature, which is multidimensional and cognitive and not merely grammatical. Language is not dynamic only as a phenomenon, even its actual manifestations *function* dynamically and each one of them reflects the properties of language as a whole. In this sense, language is a **fractal**. Even terms as 'grammar or structure of information' are misleading inasmuch

as they imply a structure, while the *raison d'être* of so-called proleptic and 'dislocated' utterances is reflecting a natural iconic pragmatic order relatively independent of the constraints imposed by the structure of the language in which those utterances are produced. Proleptics are narrowly akin to topic-first utterances, which are spontaneous and as such require a minimal encoding and decoding effort, while grammatically well-formed sentences must conform to grammatical rules, especially of word-order and agreement. Proleptics often include the presence of a co-referent element both in the main and in the subordinate clause, most often with some kind of agreement, so they include a morpho-syntactic component, while topic first utterances most often do not. Yet there is an affinity between the dynamic parameters of utterances with focalization or topicalization and of so-called proleptic ones, too consistent to be imputed to coincidence alone. As they are founded on pragmatic and communicative factors, proleptics precede their syntactically well-formed, *i.e.* grammatical vis-à-vis, of which they are the second stage in the gradual displacement from the pragmatic to the grammatical mode.

The first stage in this scheme is represented by utterances where a focalized element is not grammatically linked to a following clause. It is not with extra-position that we're dealing but with position; not with the stabilized order characteristic of grammar but with the emergence of order out of the entropy characteristic of pragmatics; in other words with proto-grammatical utterances, in which iconic, archaic and strongly biologically motivated mechanisms such as focus of a first utterance becoming topic of a second one – which is the reason of the affinity between so-called prolepsis and definiteness, both of which are essentially pragmatic phenomena – and not with the counter-intuitive symbolic and highly complex mechanisms by which the syntactic subject of a sentence would become the subject of another one which governs the first. If an element is presented as focus, it is due to its status of pragmatically focal information.

Pragmatics is the alpha and omega of language emergence, function and structure. Lamarck (1806): *Les usages font les formes*, i.e. **Function creates Organ**. This is the conclusion of evolutionary

biology, and language is a biological phenomenon, a product of evolution. Just as there is a *pragmatics* consisting in the use of constituted language (which is the traditional meaning of the term), there is a pragmatics before the emergence of language, which ends up creating the language faculty itself. Grammar is the part of language ever systematizing out of interaction in pragmatic use. It is therefore a mechanism of organization, in other words of reduction of the entropy characteristic of pragmatics. The central concept of pragmatics is *context*. Context is what pragmatics is about. Grammatical rules are pragmatic since they consist in the application of allo-forms depending on linguistic context, namely co-text, cf. morpho-syntactic agreement/concord as well as multiple encoding in general (see also Kirtchuk 2007). It follows that, as anaphor is but intra-discursive deixis (Kirtchuk 1993) – and deixis is probably the first linguistic function to have emerged (Kirtchuk passim) grammar as a whole is but intra-discursive pragmatics. Grammar is neither autonomous nor universal; to a point, pragmatics is both. Language is not reducible to grammar, it is

Keywords:

Pragmatic-Deictic mode

(Topic-) Focus
Hierarchy
Utterance
Intonation / Prosody
Motivated
Imposed
Iconic
Pre-rational
Biology
Non-Formal
Tendencies
Induction / Abduction
'Hardware'
Ontogeny
Creology
Phylogeny
Oral
Spontaneous
Communication
Interaction
Context-dependent
Concrete
Dialogic
1–2 Person (+ n.– P.)
Deictics, Gestures
(Linguistic cum) Gestural
Lamarck, Darwin, Bühler
Bolinger, Greenberg, Maturana
Givón, Ochs, Kimura,
Lieberman, Kirtchuk

Grammatico-Semantic mode

Subject-Predicate
Structure
Sentence
Syntax
Arbitrary
Conventional
Symbolic
Rational
Mathematics
Formal
Rules
Deduction
'Software'
Adult Language
Systematized Language
Present-day language
Written
Planned
Conceptualisation
Thought
Context-free
Abstract
Dialogic or not
Non-Person (+ 1, 2p.)
Nouns, Lexemes
Solely linguistic
Saussure, Jakobson,
Chomsky

Daneš, Kiefer, Hagège
Lambrecht (?)

pragmato-centric not grammato-centric the way our astronomical system is heliocentric not geocentric. All linguistic utterances can be deprived of grammar but not of pragmatics. Pragmatic functions may or may not freeze into syntactic functions but syntactic functions do not freeze into pragmatic ones. So, the *δοξα* according to which *focalization* and *topicalization* are dislocations or detachments is false (Kirtchuk 2005). Semantically, the meaning of words does not precede the things to which they apply. It is an abstraction of myriads of interactions, i.e. of negotiation between co-enunciators. Thus, even semantics is pragmatic.

Language emergence is an autopoietic process which cannot have taken place but in a species engaged in close social relationships spanning all aspects of life and all periods of the year, practising extensive and consistent collaboration

and cooperation rather than competition and war though not restraining from them (Maturana 1973 sqq.). Language as a continuous, conscious and collaborative interaction is a permanent encounter (Buber 1923: *Alles wirkliche Leben ist Begegnung*); in ethically inspired terms, as language allows to exert the permanent ability and need to share with other languaging beings, it is *selfless behaviour* (Lieberman's 1991). In Maturana's terms (1978) language results from and denotes *love*. For the psychological aspects, cf. Mitchell (1988). Language Science (LS) cannot be constrained to language as such (even less so to grammar) for It is the locus where many fields converge. Thus, LS can only be a *Scienza Nuova*, in the spirit of Giambattista Vico. Investigation of language 'In itself and for itself' (de Saussure), is bound to give results both partial and false.

NEUROBIOLOGICAL MECHANISMS OF THE "TRAGEDY OF COMMONS"

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Economic theory predicts the overexploitation of common resources. This claim is illustrated by the "tragedy of the commons" dilemma (Hardin, 1968) in which independently and rationally acting individuals will ultimately deplete a shared limited common-pool resource (CPR). This situation represents a dilemma, because when each individual chooses the payoff-maximizing strategy of taking out the maximum from the resource each individual will in the long run receive a lower overall payoff than if all persons had used the resource moderately. Important real life examples of CPRs include fish stocks, woods, as well as water resources. Here we hypothesised that the over-consumption of CPRs is driven by a fundamental mechanism of social competition. More particularly, we hypothesised that differential dopamine-related neuronal activity in social and private contexts underlies CPRs overexploitation.

Methods: Twenty-eight adult subjects participated in the CPR game. Half of subjects were confronted with a depleting "common" resource of fish (social condition) and the other half with an identical "private" resource (non-social condition). Subjects learned either that resource depletion could be attributed to the behaviour of other players (social context) or that resource depletion was due to the

environmental migration of fish (non-social context). To analyze neuroimaging data we constructed separate regressors for different scenarios of resource depletion. Overall, we probed the neural underpinnings of CPR depletion using the statistical contrasts between social and non-social condition.

Results: As expected, subjects depleted the resource of fish significantly faster in the social condition than in the private one. Interestingly, after the destructive depletion of the resource by other players (social condition) subjects also depleted the resource in the next trial, whereas, in the non-social condition identical reduction of the fish stock triggered resource preservation. We found that resource depletion in the social condition evoked specific deactivation of the nucleus accumbens that correlated with individual behavioural tendencies. The interaction of the nucleus accumbens with the dorsal lateral prefrontal cortex and an extensive follow-up analysis of the extended dataset will be discussed.

Conclusions: Our preliminary results suggest that the widespread overexploitation of the common properties, e.g., fisheries, might be caused by the specific response of the dopamine system to perceived social competition.

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ENCODING TRAJECTORY: SOUTH EASTERN HUASTEC (MAYAN, MEXICO)

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South Eastern Huastec (HSF) is an endangered Mayan language spoken in Mexico by about 1700 people. It is the least known member of the Huastecan branch of the Mayan language family. This is the first study on the expression of space in this language, carried out within the Trajectoire Project of the Fédération de Typologie based at the

DDL in Lyon. This presentation will briefly present the HSF morphosyntactic means for encoding space (prepositions, relational nouns, locational words, verbs of movement and posture) and will then focus on the expression of motion in this language.

HSF has only one preposition that expresses the basic locational notion, like *en* in Spanish or *at/in/on* in English), therefore adpositions in this language do not differentiate between Source and Goal; it is actually the verb that bears the meaning of Trajectory:

Goal
1 a) **och-ich ti juun i jool**
enter-COM prep one NM cave
(He) entered/went into the cave.

Source
b) **kal-ej ti juun i jool**
leave-COM prep one NM cave
(He) came out of a cave.

The phenomenon of absence of directionals (as well of verbal suffixes, particles, pre-verbs, verbal prefixes) in this language lead to an interesting coding of the Trajectory: unlike many other Mayan languages, for ex. Tzeltalan or Q'anjob'alan (Brown 1994, Craig 1994, Grinevald

2006, Grinevald 2010, Mateo-Toledo 2004, Zavala 1993, Zavala 2002). Instead, when it comes to encoding Path, HSF uses complex sentences sequencing the event, one clause describing motion/ Path, and the other the Source or the Goal. This is illustrated in the following examples:

2 **bel-ej juun i txithan // kub-at wik t-in akan i te'**
walk-COM one NM girl stand-PPL PAST prep-E3 feet NM tree
(Litt: *A girl walked; she had been standing at the foot of the tree.*) (T32-4)
Desired reading: *A girl walked away from the tree.*

3 **taal ti bel-al // och-ich ti eemlam** (T26-3)
come.irr SUB3 walk-INC enter-COM prep maize
(Litt: *Here (she) comes walking; she entered the corn field.*)
Desired reading: *She went into a corn field.*

The HSF examples will be then compared to those from other Mayan languages to argue that the HSF way of encoding represents an early stage of the expression of trajectory in the family, resembling by its complex sentence constructions some other languages.

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CONCEPTUAL METAPHORS OF TIME IN ENGLISH AND RUSSIAN

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The linguistic time as a temporal category is expressed by different means of a multi-level language system. Metaphor and metonymy are the basic linguistic means of expressing the Time concept.

The significance of the research lies in the diachronic and synchronic studies of the verbal means of expressing the Time concept dynamics in different languages. The cross-linguistic interaction at particular stages of the formation of the modern Time concept has been studied on the basis of the Russian and English languages.

The Christian Time Model. The formation of the notion of time as a valued entity common to Russian and English speakers was mainly influenced by the Christian religion. In the Christian world outlook, Time acquires axiological dominance, and it is interpreted within the basic conceptual metaphor TIME IS A GIFT OF GOD/ ВРЕМЯ – ДАР БОЖИЙ. Time is perceived through the metaphoric analogy between the temporal domain and the domain 'Gift of God' which embraces the Universe created and governed by God. The framing capacity of this metaphor notable for high frequency of occurrence and a wide variety of verbal expressions is revealed in Russian and English literary works of the XVII–XX centuries.

The Economic (Pragmatic) Time Model. Change in meaning of the Time concept is caused by changing values of a language-speaking society: with loss of faith, the spiritual treatment of time is substituted by material values. This entails a gradual categorical shift in the source domain of the Time concept: the frame of the source domain 'Gift' loses the basic concept 'Bearer (of the Gift)', which

disturbs the structure of the source domain. The concept 'Receiver (of the Gift)' is foregrounded to become the key concept 'Owner' in a new source frame. The concept 'Possession', which belonged to the frame 'Gift', now underlies the new conceptual metaphors TIME IS A RESOURCE; TIME IS A COMMODITY and TIME IS MONEY in the British-American conceptual domain. The verbal means of expressing these metaphors were studied by use of lexicographical, corpus and text resources.

In the Russian language, the metaphor TIME IS A RESOURCE appeared in the XVIII century. The set-phrase *time is money* became conventionalized in the XIX century, but it was not accepted by the Russian national consciousness up till the late 1980s. The increase in linguistic expression of the metaphoric schematas TIME IS MONEY/ TIME IS A RESOURCE has been observed in the last 15–17 years.

The Technocentric (Virtual) Time Model. A new technocentric image of Time structured by the metaphor TIME IS A VIRTUAL ENTITY appeared in the second half of the XX century. Properties inherent in the domain of computer technologies become metaphorically mapped to the temporal domain: 'isolation from natural rhythms', 'high speed', 'fragmentariness'.

The conceptual shifts reflect change in cultural and moral values and indicate the deformation of the axiological component of the Time concept. With the dying of faith, the heavenly is substituted by the worldly, the spiritual by the material, the eternal by the temporary.

Along with temporal macrometaphors, the many-sided image of Time is created by conceptual mappings where Time is assimilated to two/three-dimension space, a moving object, living being, natural phenomenon and process.

MUSIC COGNITION IN QUASISPATIAL TERMS: RESPONSES TO MELODIC MOTION IN TONAL SPACE

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Abstract

Performing and analytical musical practice consistently makes use of quasispatial metaphors,

such as tessellations by M. C. Escher. The idea of the visualization of music first entered the psychology of music with Dowling's (1972) pioneering research in melodic contour transformation. More recent studies in perceived tonal tension (Bigand et al. 1996; Lerdahl and Krumhansl 2007; Korsakova-Kreyn 2009) and the latest investigations into the neurological correlates of melodic processing

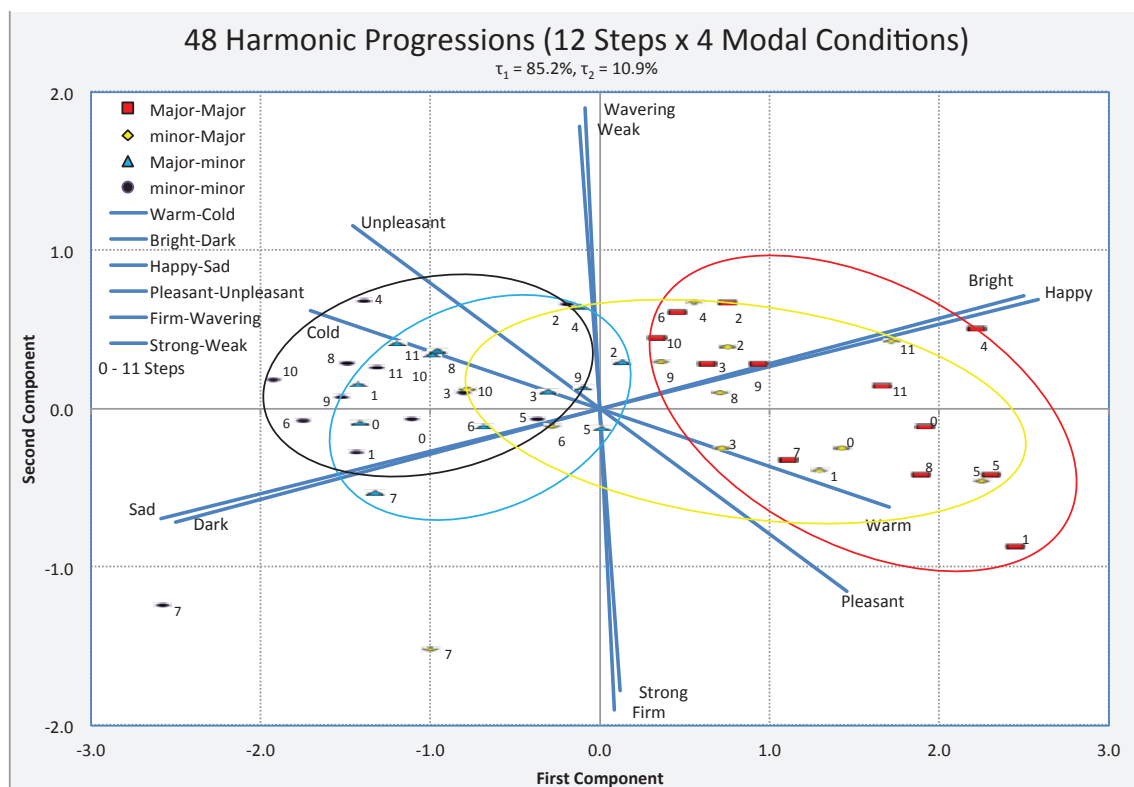


Figure 1. Sensitivity to the major and minor modes: The endings of musical phrases on a major triad (red squares and yellow diamonds) were perceived as “warmer,” “brighter,” and “happier” than the endings in a minor mode (black dots and blue triangles) (Korsakova-Kreyn, 2009).

(Foster and Zatorre 2010; Zatorre et al. 2010) have brought into focus a concept of melodic shape as it is affected by motion in a tonal force field endowed with “phenomenal gravity.” The idea of an artistic field seen in terms of pangeometry was first articulated by Florensky (1925); for the aesthetics of music, this idea was expressed in terms of a “phenomenal space of tones” by Scruton (1997). Incorporating Pavel Florensky’s theory of aesthetic pangeometry into research in music perception offers a novel approach to understanding emotion in music and provides support for treating melodies as melodic shapes in a tonal “force field.”

The proposed poster presents two studies: a study in mental rotation of visual and melodic shapes and a study in the emotional response to tonal distances in music. The study in rotation (Korsakova-Kreyn and Dowling, under review) compared the perception of transformed melodic shapes with perception of rotated 3-D geometrical objects. The participants were asked to perform three tasks: (i) a task on visuospatial congruency with a set of 122 pairs of 3-D geometrical images from Shepard and Metzler’s (1971) study in mental rotation, (ii) a task on melodic congruency with a set of 27 pairs of melodies (each was an original

melody from clavier compositions by J.S. Bach), (iii) and a controlled task on perception of changes in timbre of between one and three separate tones in the same melodies. The results revealed a positive correlation between performance on the visuospatial rotation task and the melodic transformation task. The pattern of correlations showed gender effect.

The second study explored the quasispatial properties of tonal space by means of two experiments in affective responses to reorientation of a musical scale on different tonal centers (Korsakova-Kreyn et al. 2008; Korsakova-Kreyn 2009; Korsakova-Kreyn et al. under review). Reorientation of a tonal center in tonal space is called modulation. The responses to modulation were measured with semantic differentials. In the first experiment, participants responded to a set of 48 progressions modulating to all possible degrees and all possible modal conditions. The results indicated that affective response depends on the degree of modulation, on key proximity, and on mode (Figure 1). Experiment 2 employed a balanced set of 24 artificial stimuli and 24 fragments from real music compositions and examined affective response to modulations to three selected steps (IV, V, and lowered VI) in the major mode only, which guaranteed the ecological validity

of stimuli. The results agreed with the theoretical model of pitch proximity based on the circle of fifths and demonstrated the influence of melodic direction and musical style on emotional response to tonal modulation.

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FLORENSKY'S AESTHETIC PANGEOMETRY IN MUSIC COGNITION

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Abstract

“... everything which is able to act, while creating changes in the characteristics of reality, that is, while communicating some acceleration to the uniform state in time of these characteristics – this can be rightfully called the force.” Pavel Florensky

Florensky's theory of aesthetic pangeometry offers important ideas for research into emotion in music and provides theoretical support for recent discoveries in the neuroscience of music.

Musicians routinely use quasi-spatial metaphors in analyzing musical compositions, for example, by illustrating polyphony with the tessellations by M. C. Escher. In music psychology researchers make use of comparisons of melodies with visual contour (Dowling 1972) and with shapes rotated in three dimensions (Korsakova-Kreyn and Dowling under review). To understand the quasispatial properties of melody, we need to elucidate the properties of the “tonal space” of music. Music's tonal system of reference is a musical scale. The hierarchical organization of a scale is based on perceived attraction of the tones of a scale to a tonal center (Krumhansl and Kessler 1982) musical scale. The tonal hierarchy resembles a gravitational force field (Figure 1). The idea of artistic force field in terms of pangeometry was first articulated by Florensky (1925). For the aesthetics of music, this idea was expressed in terms of “phenomenal gravity” by Scruton (1997).



Figure 1. A tonal scale can be described as a gradient of tonal gravity. The tonal “force field,” as a system of reference, is formed by the relationships among musical sounds. In a C major scale, the tones are attracted with varying degrees of intensity to the tonic, C. The main morphological principle in music springs from these relative differences in the intensity of attraction of tones in a given scale to its center of tonal stability, the tonic.

The results of studies in perceived tonal tension in music (Lerdahl and Krumhansl 2007; Korsakova-Kreyn 2009) and in the neurological correlates of melodic processing (Foster and Zatorre 2010; Zatorre et al. 2010) have brought into focus the concepts of tonal force field and melodic shape. The neuroimaging research has offered supporting evidence for the author's hypothesis of modality transcendence in melodic perception, which suggests that melodic and visuospatial processing share the same neural mechanisms in the parietal areas. The explanation of tonal space in terms of phenomenal gravity involves a concept of gradient of neural cost of auditory processing, which connects the psychophysics of consonant and dissonant melodic intervals to the frequency spectra of the tones that make them up: The sharing of essential information between the tones of the Pythagorean intervals (Octave, Fifth, and Fourth) – namely the commonality of their strongest overtones (counting octave equivalence) – most likely results in a greater economy of neuronal cost of processing

for the consonant intervals as compared to other melodic compounds. The hypothesis of the gradient of neural cost of processing for melodic intervals has received indirect support from recent studies on frequency-following responses in brainstem (Bidelman and Krishnan 2009).

Presenting melodic patterns in terms of a “force field” allows the transition from psychophysics to affective neuroscience of music. The notion of a dynamic tonal field is linked with the concept of neurodynamics (Panksepp 1998) and with the “archaic model” of emotional processing (Korsakova-Kreyn 2009). The latter draws on the theories of McLean (1990) and Panksepp (2004) and on a concept of embodied cognition (Damasio 1994). The archaic model suggests that the main morphological principle of music—“tonal gravity”—mimics and embodies the most primitive reactions of the living organism to its environment, which are tension and release. Explaining affective responses in music in terms of neural efficiency suggests a novel approach to music cognition. The application of Florensky’s theory of aesthetic pangeometry to music perception emphasizes music’s importance for research in human cognition.

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THE AGE DIFFERENCES IN SOCIAL FACTORS OF THE OVERIMITATION EFFECT

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We conducted our study to explore more on the idea of the overimitation mechanism. Children imitate adult’s irrelevant actions on a new object although they don’t make them while manipulating with those objects without such adult’s demonstration. We suppose that children perceive adult’s actions on an object as an invitation to a convention on using the object.

A number of works suggest that «social» variables do not influence this effect (Lyons et al., 2007). But our experiment reveals that children overimitate irrelevant actions only when they see the confident behavior of an adult and do not reproduce these actions if an adult shows that he has not yet

seen the object either (Kotova, Preobrajenskaya, 2009).

At the same time it occurred during another experiment that our subjects overimitated the series of irrelevant actions even after it was changed. We have demonstrated an unfamiliar object to every subject applying two different irrelevant action sets on this object twice with a time interval between the sets and children preferred to overimitate Set 2 after Phase 2. This preference could not result from a memory deficit because during our next experiments children overimitated actions which they had seen only once 7 days before.

Contrary to N. McGuigan’s view (McGuigan, et al., 2010) we have discovered that “social” variations have distinctive effect in different ages. We have replicated Lyons and his colleagues’ (2007) procedure where they directly instructed 4-year old children not to make irrelevant actions. Our 7-year old subjects haven’t overimitate under such instructions.

CROSS-DISCIPLINARY APPROACH TO EXPERT ACTIVITY COGNITIVE INTEROPERABILITY SUPPORT

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Cognitive modelling issue, also applied in linguistics, emerged in 1970-s. Since then it's been in continuous demand, and became world-known. This way, in 1976 Robert Axelrod (Axelrod, 1976) suggested the concept of cognitive maps to be applied in various problem-oriented domains, namely, those socially significant and political ones. In the middle 1980-s George Lakoff (Lakoff, 1987) considered cognitive aspects of mastering information by human, especially it dealt with concepts categorization (cognitive and linguistic modelling of human perception).

All these directions are urgent today as well. Linguistic research adopts explicit cognitive bias (Croft, W., D.A. Cruse, 2004) under necessity of taking into account peculiarities of information perception by human and mechanisms of concepts mining, establishing relations between them, and building classifications. In Russia cognitive research is also conducted actively, especially in linguistics (Kibrik, 2007; Kibrik, 2008; Parshin, 1996; Kasevich, 1998).

In Cognitive linguistics dramatically important concepts which might be applied in other knowledge domains appear. One of such concepts is the concept of cognitive space (Newby, 2001; Alferov, 2007; Gourevich, 2007; Gourevich, 2009). According to Gourevich, cognitive space introduces itself as an operational self-generating and self-regulating system in which human communicative experience is forming, developing, and transforming itself (Gourevich, 2009).

In the paper it is suggested to exploit the concept of cognitive space for the good of expert activity cognitive interoperability support, for instance in the scientific sphere. The concept allows to bear in mind multidimensionality of experts' interaction and their activities, namely, when dealing with uncoordinated systems of terms or lack of critical concepts definitions. Moreover, in the above mentioned interactions one of the key concepts becomes cognitive interoperability¹ suggested by Buddenberg in 2006 (Buddenberg, 2006; Zatsman,

2009). It supplements the concept of cognitive space with an aspect of situation awareness and emphasizing experts' abilities to coordinated information patterns retrieval which they handle in the course of their activities.

The proposed approach to expert activity cognitive interoperability support involves application of computational linguistics methods, techniques of cognitive psychology, and artificial intelligence methods. Within the framework of the approach it is supposed to:

- Develop linguistic methods and models of support of cognitive interoperability of expert information and analytical activities in the scientific sphere.
- Build corpus of multilingual parallel texts from various domains. In the case, such corpora are meant for accumulation of empiric data from domains' problematics, namely, in the issues of completeness and consistency of systems of terms, expert information and analytical interaction, etc., as well as for approbation of the built corpus and cognitive-linguistic methods on real cross-language data.
- Develop software to test the approach on modelling of cognitive space of experts' interaction within the chosen domain. It's also suggested to test the software in the interdisciplinary tasks, as follows: to solve terminological disagreements among experts of the neighboring fields, to restore adequate causative-consecutive relations between concepts of the domain given, to support decision-making in case of underdetermined systems of terms or their absence, and other tasks.
- Creation of new generation IT capable of considering peculiarities of various levels expert interaction within domains, as well as in the interdisciplinary tasks.

The following tasks and problems might be considered as possible applications of the approach suggested: coordination of expert activity from various domains within information systems in semiautomatic/automatic regime; interdisciplinary scientific research of different subject fields aiming to develop problem-oriented software and establish interaction between experts of various levels of proficiency; study of methods and approaches of computational linguistics and its adaptive applications to create new generation IT.

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EISENSTEIN'S THEORY OF THE COMIC AS A (META)COGNITIVE PROJECT

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Sergei Eisenstein's (hereafter SE's) theory of the comic is virtually ignored by Russian and Western scholars alike – amazingly, even by Vyacheslav Ivanov (1998). Meanwhile, it takes a special position in the international humor scholarship, presenting an ingenious synthesis of Hegelian philosophy and evolutionary thinking, and sharply contrasting with the miserable produce of Soviet aestheticians. It is part of SE's now-famous project *Grundproblem*, which links the modern mind with the primitive mind.

According to SE, the comic results from a “formal application of the basic principles of dialectic to a context which excludes them (primarily because of being static).” The comic, then, is “formal dialectic” or “formal unity of the opposites” (Eisenstein 1966: 516–517). These definitions resemble those suggested by Olga Freidenberg (1973: 512), who described the comic as “that which usurps the formal aspects of the real.” As SE claimed, his formulae are wider than any of those suggested by previous

theorists, including Bergson's “mechanization of life”. SE points out that the “pygmalionization” (coming alive) of artificial objects, too, can appear ludicrous.

The reason behind the “formal dialectic” is the subject's psychic duality, whereby he contemplates the object from two standpoints: his present one and that of himself in the past, his own and that of the species. The comic is “a system of prelogical beliefs in the context of (post) logical ideas” (Eisenstein 2002, vol. 1: 425). The regression – a form of escapism – can thus be both ontogenetic as in Chaplin's infantile humor (idem 1968: 496, 503) and phylogenetic as in Disney's films (idem 2002, vol. 2: 262). This might evoke parallels with Freud and Jung, respectively. But SE focuses neither on repressed sexual drives nor on mystical archetypes; instead, he addresses the totality of evolving beliefs constituting the subject's individual and collective memory. The comic turns out to be the opposite of pathos. Both are integrated under the *Grundproblem* since both are regressive: the subject views the world through his own eyes and those of a child or a remote ancestor (idem 2006: 67).

“Pygmalionization” in Disney's cartoons marks a quasi-regression to animistic beliefs. Likewise, the

story about “miraculous birth” actually resulting from adultery can appear comic only if belief and disbelief in miracles overlap in the subject’s mind. “Faith and reason do not laugh. The former prostrates itself before the myth; the latter annihilates the myth... Contrary to the religious stage, which conforms to these ideas, contrary to the scientific stage, which eliminates them by common sense, a comic structure is based on the blend of these two mental levels. Two viewpoints separated by ages of evolution suddenly merge... The comic compels the modern mind to pose as the primitive mind while retaining all the properties of the modern mind and all its knowledge” (idem 1966: 481–482).

Indeed, the genetic analysis of domestic folktales reveals remnants of archaic beliefs reinterpreted in a parodic fashion (Propp 1986: 145–150; Meletinsky 2005: 199–200; Yudin 2006: 95–98, etc.). But humor in these stories may also stem from the fact that stratified society is viewed from the standpoint of egalitarian society and therefore appears absurd (Yudin 2006: 72, 110, etc.). Folktales about tricksters and fools “reproduce archaic mental schemes in a modern historical setting” (ibid.: 185). In short, both mutually parodic views – top down and bottom up – may be present in the same texts. The relevance of these observations, which strikingly agree with SE’s ideas, extends far beyond folklore studies.

According to SE, however, the subject may regress not only to the mythological past, but also to the early stages of human evolution. Hence the comic potential of the loss of balance, revealing the “obscure sphere of atavistic association” and the instability of our “triumph in the acquisition of bipedy” (Eisenstein 1966: 485, 487). Proceeding further down the evolutionary past, SE mentions Disney’s animated cartoons and other works of art where vertebrates acquire an amoebic flexibility. The contour “coming alive” parodies the dialectic principle of extasy as self-transcendence (idem 2002, vol. 2: 263–266, 289–292, 507).

According to SE, the difference between pathos and the comic is that art based on pathos renders the dialectic transition from one quality to another in a correspondingly dynamic manner whereas the comic is a static imitation of this process (idem 1966: 514). SE, however, stopped short at concluding that pathos is a relation to a real or imaginary world (cf. Dali’s paintings, which realistically – contrary to Disney’s cartoons – reproduce rigid bodies as flexible), whereas the comic is a second-order relation – a metarelation, which neutralizes the relation. The comic has no objects in either reality or fantasy; its sole objects are empty mental representations – according to

SE, remnants of past worldviews – with which our mind plays. The comic alone can be regarded as a secondary modeling system, being opposed to language, serious art, serious play, and ritual as primary modeling systems, which the comic parodies (Kozintsev 2010). Unlike pathos, the comic is based on pure self-reflection. Reality or fantasy can engender pathos by themselves (cf. the “realistic” *Bamby*), but to become potentially comic, they must be parodically reinterpreted.

SE (2002, vol. 1: 434–436) describes circus art as a “content in and for itself”, which does not admit any political or topical add-ons. Ivanov (1998: 297, 300) interprets this as an implicit disclaimer of the entire project of Soviet art as ideology. Actually, because circus art is a blend of pure pathos, which can provide a form for the ideological content, as in SE’s own works, and pure comedy, specifically clowning, which alone is inherently alien to topicality, SE’s statement can be matched with Freidenberg’s (op. cit.: 492) idea that parody is a “strict form without a content”. The clown plays no role other than that of generalized *Homo sapiens* who plays a role that is inappropriate for him. The conflict underlying the comic is generic and thus deeper than any individual or social conflicts underlying pathos.

In sum, SE’s theory of the comic, which focuses on the evolving subject’s self-reflection, is intrinsically metacognitive and subjectivistic despite its outward affinity with Hegelian objectivism. It is a major step toward understanding man as a dual biocultural being capable of reflecting on his mental evolution.

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SELF IN ITS ENTIRETY: A SOCIAL-COGNITIVE PERSPECTIVE

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Theoretical background. In a most common point of view, self can be described as representation (Paulhus & Trapnell, 2008). According to cognitive-affective processing system (CAPS) of personality proposed by Mischel & Shoda (1995), self is a core part of personality that can be described as a network of different cognitive-affective units (Mischel & Morf, 2003). The processes in the CAPS are likely to be parallel-distributed. The knowledge-and-appraisal personality architecture model (KAPA), proposed by Cervone (2004), and based on the works of Mischel & Shoda, makes distinction between knowledge structures and appraisal processes of their interaction. The knowledge structures in KAPA model include self-schemas and situational beliefs. Discrepancies between different knowledge elements may provoke different emotional states, especially discrepancies between actual knowledge and personal standards (Higgins, 1987). Although accessibility of self-knowledge varies across time and situations, it is proposed that permanently accessible knowledge structures foster the cross-situational coherence.

Theoretical model. We suggest that self as representation can be modeled as a PDP network consisting of personal constructs. The whole system represents self as memory (Kihlstrom et al., 2003). Following the CAPS theoretical framework, only a limited subset of constructs is actualized by cue features of the actual situation every single moment, and it forms the representation of actual, experiencing self. In fact, the actualization of a single construct means arousal of several knowledge elements of the net simultaneously, because it leads to an attribution of several aspects of the self, the most important of which are the actual state of the self (input units of the net) and personal standards for desired or ought selves (units in hidden layers). Appraisal processes, such as self-related emotions or automatic thoughts and heuristics, are fit in the model as interconnections between units. Personal standards can be viewed as goals of self-representation system and the system tries to achieve them by adjusting the thresholds of input units and weights of the forward and recurrent interconnections. We argue that all other structures in the representation of the self, such as self-schemas, beliefs about the self, personal values etc., can be conceptualized as states of the system at higher levels of analysis in terms of nonlinear

dynamics. Thus the self is viewed as a complex system capable for self-organization with many possible stable states that guide the behavior of the person in different situations.

Procedure. 23 undergraduate students took part in experiment. Every one of them filled in identical blanks during many (up to 100) consecutive days. First task was to scale themselves by 44 characteristics of emotional state; the characteristics were chosen through the pilot study earlier. The second part of the blank was a repertoire grid. The constructs for the grid were produced by subjects by completing the sentences about themselves, the objects for evaluation were different aspects of the self (real, ideal, past etc.).

Modeling the self-system. The results were analyzed ideographically for each subject. Factor analysis for 44 characteristics of emotional state was conducted to describe the emotional structure of each subject and to characterize its everyday state. Self-appraisals were formalized as a distance between the real self and ideal self as well as distances between the real self and the ought self in dimensions of produced constructs in the repertoire grid. Situational beliefs about the self were formalized as distances between other aspects of the self (for instance, we assume that the distance between the real self and the self as it is viewed by others reflects the situational beliefs about similarity with others, such as, for example, like "I am strange" or "I am not like many others"). To characterize the state of the system of constructs at the very basic level we use the following procedure. Only highly accessible constructs, which were used not less than in 20% blanks, were selected. The ϕ correlation coefficient between the conjoint using of each pair of the selected constructs was computed. The matrix of metrics $|1-\phi|$ was used for further multidimensional scaling. The coordinates of the mass center of used constructs in the resulting space were used as variables to describe the state of the system of constructs for each day. Correlations and multiple nonlinear regression analysis were conducted to find out ideographical relations in the self-system organization.

Results and discussion. We have found the following:

1. Highly accessible constructs form the small subsets of all constructs used by every particular subject (not more than 25%; typically about 40–50 of 190–280 total), many of them has significant ϕ -coefficient of co-appearance. They also tend to form time-series of being used/not used. These

results are interpreted as flags of self-organization processes in the system of the self constructs.

2. The most stable variables of the system are evaluations of the desired and ought selves by the highly accessible constructs. Variance of these variables is always one of the lowest and for the most of subjects is significantly less than the variance of evaluations of the real self. It seems that personal standards are the real dispositions of the self and personality, not highly accessible constructs or personal traits. This result confronts the proposal about the leading role of highly accessible constructs in producing the cross-situational coherence.

3. The distance between the real and the desired selves, as well as between the real and the ought selves, have a very strong correlation with the first extracted factor characterized the emotional state for each subject. This result supports the thesis that appraisal processes are the basis for self-related emotions and emotional self-experience.

4. Regression analyses showed that situational beliefs are highly determined by the actual emotional state and are of little impact of the accessibility of the frequently used constructs. Nevertheless, if we start building models for moving averages instead of raw variables for each day, the significance of emotional variables decreases as well as significance of variables of the system of the constructs increases alongside with the increasing of the interval of averaging. It means that cross-situational dynamics

of the self system depends upon the constructs actualized by the cue features of the actual situation, but long term dynamics is determined by the changes of the accessibility of different constructs. Because accessibility of the constructs determines the way the self is reconstructed, these results shows that situation-specific changes in constructs' accessibility underlie the cross-situational malleability of the self-concept, and slow changes in accessibility of the frequently used constructs underlie the experience of the continuity and consistency of the self during the life span.

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THE EFFECTS OF TRANSCRANIAL MAGNETIC STIMULATION OF BROCA'S AREA ON SHORT-TERM MEMORY

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In humans the ability to buffer verbal information for a short period of time is crucial for meaningful communication. Borrowing metaphors from computer science, it has traditionally been assumed that this short-term buffering of verbal information is accomplished through the function of a dedicated language independent mechanism, analogous to Random Access Memory in a personal computer. An alternative view is that verbal short-term memory (STM) is a process that emerges from the function of general mechanisms responsible for perceptual organization and linguistic motor planning. One central argument is that if it is possible to explain all verbal STM phenomena in terms

of perceptual-gestural processes then invoking additional bespoke STM mechanisms becomes unnecessary and violates the law of parsimony.

A classic effect in the verbal STM literature is that the order of phonologically similar items is more difficult to remember than the order of phonologically dissimilar items. Store-based accounts of verbal STM tend to ascribe this phonological similarity effect (PSE) to the functional limitations of a language independent bespoke store. Here we present evidence challenging this view. We report an experiment in which inhibitory theta burst transcranial magnetic stimulation was administered to the speech planning area, Broca's area, of healthy volunteers. Participants whose speech planning ability was thus temporarily reduced displayed a reduction in their PSE. Because inhibitory stimulation was applied to a brain area clearly involved in speech it seems that speech based mechanisms sufficiently account

for this classic verbal STM effect. Moreover, the lack of necessity to invoke a language independent bespoke short-term store to explain the classic effect of phonological similarity also casts doubt on the need to assume the existence of a short-term store in general.

In addition to informing current concepts of STM, the present study also represents an important early step towards accurately mapping

verbal short-term memory functions onto different brain areas. One day this might allow an improved prediction of potential short-term memory problems in patients with selective brain damage like Broca's aphasia.

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SOUND TRANSPOSITION AS ANALOGICAL ENCODING OF 'REVERSE'

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Current investigations give special importance to non-arbitrary phenomena in language, expand the notion of iconicity beyond onomatopoeic ideophones, and recognize "the two faces of signs – the iconic face and encoded, arbitrary face" (Klima & Bellugi 1979: 79). Different fields of science converge to recognize significance of mimesis at earlier stages of evolutionary trajectory and its diminishing role in the course of historical change from iconicity to arbitrariness (Danesi 1993; Donald 1991; Jakobson and Waugh 2002; Sadowski 2000; 2009; Wescott 1980; Левицкий 2008 to name but few).

Inspired by the idea that the families of signs can share some constant formational component that appears to be a constant content element as well (Klima & Bellugi 1979: 81), we assume that metathetical patterns were employed to conceptualize 'reverse' in Proto-Indo-European language and effected the semantic reflexes of proto-roots and stems.

The object of this paper is to examine iconic value of sound transpositions in Proto-Indo-European roots and their effects in the structure and meaning of the reflexes in daughter branches. It is argued that proto-roots contained instances where there existed non-arbitrary connection between the inversion of adjacent or non-adjacent components in the pattern and the relevant meanings of the linguistic units.

To shed light on the iconic origin of arbitrary linguistic signs is to observe historical changes in their form and content. Some conclusion about the iconicity of metathesis can only be made after studying sets of lexical units with sound transposition. Therefore, we examined the entire historical nests, i.e. sets of reflexes etymologized

from the reconstructed Proto-Indo-European etymons with metathesized variants. This helped to identify distinct semantic groups of roots:

(i) verbal roots of to/ fro motion (IE **ter-* 'to rub, turn, i.e. move repeatedly to and fro' vs lengthened grade variants **trē-* 'move to and fro continuously and rapidly; separate and form one entity or group', **tr̥-* 'cut and turn over');

(ii) verbal roots of inward/ outward motion (IE **uer-* 'to turn, bend' which furnished a large number of extended variants – **uert-* 'turn toward' vs **uret-* 'exchange position; reciprocate'; **uergh-* 'distort shape' vs **ureng-* 'extract, take back or out', **ureng-* 'put together, reciprocate'; **ureik-* 'intersect'; **uerb-*, **uerbh-* 'distort shape, put into a curve' vs **urembh-* 'make symmetrical, oppose'; **urep-* 'take a spiral course, repeatedly twist or coil as to encircle or enfold');

(iii) verbal roots of composition/ decomposition with reversed type of obstruction in root initial and root terminal (IE **bhendh-* 'to bind' vs **dhreibh-* 'to draw, to glide', IE **dheigh-* 'to form, to build' vs **ghrendh-* 'to grind');

(iv) verbs of speech (IE **tolk-* 'to speak, make something clear' vs **tlok-* 'proffer for someone to accept or reject');

(v) names of animals and their taboo distortions (IE **ul̥kʷ-os* 'wolf' vs taboo variant **lukʷo-* 'wolf');

(vi) terms of kinship (IE **am (m) a* vs **māmā* 'mother', **appa* vs **pap (p) a* 'father', **atta* 'father, mother' vs **tata-*, **tēta-* 'Daddy').

All groups of the analyzed IE roots and their reflexes in different daughter branches have revealed connections to 'reverse', the conceptual core that is projected onto derivative oppositions of 'inside/ outside', 'integration/ disintegration', 'sacred/ profane' etc. It is clear that metathetical structures provide an iconic link connecting the linguistic sign and the signified, enact an image of something that is the opposite or reverse. Although, the identified proto-meanings show considerable immunity to historical changes, the traces of iconic

recession in reflexes are found in their meaning satiation, usage restriction, formal and semantic diversification due to independent development of daughter branches. It is also important that in modern speakers sound transpositions more often occur as a result of diminishing speech monitoring, assimilation of borrowing, or word-play.

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LANGUAGING AS A CONSENSUAL DOMAIN OF COORDINATED INTERACTIONS

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Abstract

In mainstream linguistics (and, broadly, cognitive science) language is viewed as a symbolic system – a set of abstract forms that somehow relate to aspects of the world which exists independently as ‘objective reality’. On such approach, the core problem in cognitive science – the problem of meaning – becomes insoluble because of the ‘symbol-grounding’ problem (Harnad 1990), when abstract symbols (particularly, graphic artifacts) are identified with signs of natural language, which are acoustic phenomena integrated in dynamically complex behavior and which, just for this reason, are never abstract (cf.: Deacon 2011).

Following the semiotic tradition of Peirce, and building on Maturana’s biology of cognition (Kravchenko 2011), I will argue for the intrinsic indexicality of verbal patterns which are grounded in the flux of experiential phenomena constitutive of the first-order consensual domain. This groundedness allows us to use verbal patterns as the elements of the first-order consensual domain without the consensual domain, whereby a second-order consensual domain is established – the domain of language as a manner of operating in consensual coordinations of consensual coordinations of behavior, or *linguaging* (Maturana 1988).

Linguistic interactions are relational phenomena; because a human organism is a structure determined system, what happens in language also becomes, as part of the relational space, part of the domain of transformation of the human nervous system, giving rise to what appears as mind/body mutual modulations. Thus, language is neither in the individual heads, nor “out there”, in the so-called ‘objective world’; it is radically distributed in space-time (Cowley 2011), enabling the human society to sustain its unity as a third-order living system.

Maturana’s concept of languaging allows the language sciences to depart from the outdated view of language as a fixed system of symbols (a code). Instead, emphasis should be laid on how the relational dynamics of linguistic interactions trigger changes in the dynamics of the nervous system and the organism as a whole, and how their reciprocal causality is distinguished and described by the languaging observer in terms of *mind*, *intelligence*, *reason*, and *self-consciousness*.

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REPRESENTATION OF EUROPE AND JAPAN AS CULTURAL LINGUISTIC CONCEPTS IN THE UKRAINIAN EVERYDAY STUDENTS DISCOURSE

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The cultural relationship modernization, the modern society cross-cultural development and the cross-cultural movements of the integration processes led to the mental space changes. The problem of the present and the future the dichotomy East-West, concepts "NEW EUROPE" and the European association, concept JAPAN is taken under special research in different scientific spheres: political science, sociology, philosophy and cognitive linguistics etc. The correlation of language and social reality, language and culture is taken under the constant attention in the modern linguistics. The actual directions of the researches in this sphere is Conceptual Analysis within Cognitive Linguistics.

Cognitive Linguistics can bridge the gap between Culture and Language. One of the significant aim of this research was to single out how human beings (students) conceive of, manipulate, and metaphorically extend meaning, how cultural concepts are embedded in language. As Laura A. Janda (2011) has claimed, "use of Cognitive Linguistics to examine cultural linguistic phenomena is a new line of research, relevant to the identities of thousands of speech communities on Earth". This research proved the fact of the cross disciplinary dimensions between Culture and Language study.

For a decision the set problem the method of questionnaire in which an examinee (100 students of senior courses of humanitarian faculty of PNPu) is offer 1) to describe (using 5 words, word-combinations, suggestions) the idea about Europe/Japan as integral cultural region, 2) to name countries which in their imagination are represented Europe as cultural region, 3) to mark images coming (or arising up) back to life at mention of European countries and Japan, 4) give the explanation to the following word-combinations as "European standard", "EU", "Japanese culture".

From data of questionnaire the idea of students about **Europe** consists of next features:

1) **empiric** – monuments of culture (46), euro (45), theatre (28), good roads (10), fashion (22), tourists (21), Paris (11), interesting places (10), rains (9), education (8), horse (2), churches (1), fog (1), football (1), The English language (3);

2) **logical** – progress (56), riches (48), civilization (44), humanity (22) great possibilities (20), novelty (16), civility (9), trip (9), freedom (7), traditionalism (6), EU (10), leader (3);

3) **modal-evaluation** – good life (5), envious people (1), fascists (1), White castle (2) closed country (1), amorality (1);

From data of questionnaire the idea of students about **Japan** consists of next features:

1) **empiric** – sakura cherry tree (46), tea ceremony (45), samurai (32), anime (31), dorama (22), manga (21), sushi (11), airplanes (10), geisha (9), kimono (8), theatre art (3), (2), churches (1), fog (1), Tokyo (1);

2) **logical** – is progress (70), developed country (48), civilization (44), humanity (22) succeeding (20), patriarchal (16), word of honor (9), dignity (7), robot technology (6);

3) **modal-evaluation** – feeling of beauty (5), kind people (1), separation (1), Eastern spirit which is difficult to understand to Ukrainians (2), good country (1).

According to explanation of "European standard" in word-combinations, the "European level" and "European quality" all participants of experiment examine word "European" as synonym to the words "high" and "superior quality" and attribute these word-combinations to the products and life on the whole in foregoing countries. At the same time EU was associated with Europe itself with the mark of novelty.

The cardinal changes in social life lead to the ruin of the conceptual network and the change of the value system. According to this statement, Stepin (1992: 49) follows that "the main and really epoch-making change in the value system deals with the new system rises. The value is considered to be the innovation, originality and just **new**". As a result, the concept of *novelty* is given the status of value, which is widely used in the European integration discourse.

The different histories of Japan and Europe are reflected in their respective cultures today. As Japanese history is considered to be noble (World War II excepted), the Japanese use it as a muse of inspiration for their creativity. On the other hand, European value system is based on the values of the past, or the traditional European values, and also on the new values connecting with the future. So in the analyzed data we can observe the integration of traditional European values (*self-help, tolerance, belief in strong community and society, family, home, freedom, the rule of law,*

fairness, justice, peace with the new values, such as *solidarity, equal opportunities for all, human rights and the protection of minorities, integration, new community*. The wild functioning of these lexemes is a particularity of modern discourse. This support Fomenko's thought (1998: 4) that the language representation of universal values, just as with national concepts, are changed in the discourse.

Modal-evaluation approach was in describing the word-combination as "Japanese culture": *unique, traditional, patriarchal* etc. But at the same time in Japanese culture were revealed such lexemes as *development, advanced with the preserving the traditions*. When students think about Japan in comparison with Europe, they emphasize how unique Japan seems to be, regarded Japan as this very exotic distant culture. So Japan is expected, to be *unique*. Perhaps what makes Japan seem unique is that the combinations of institutions – say education, religion, family, and so forth – the way that those are combined may be somewhat different from what we expect in Europe.

From the obtained data we may distinguish the following value systems of Japan and Europe: JAPANESE VALUES – obligation to the group, behaving according to status, harmony, effort, self-improvement, self-criticism, collectivism. EUROPEAN VALUES – appreciation for aesthetics, intellectualism, socialism, tradition, leisure, sensuality, family and friendship.

Though image about concept Japan is considered the second richest country and leader of technology

in the world, and known for having a unique culture. Japan could not have attained this height of cultural advancement without outside influence. Using examples in Japan's history, it is shown that as an isolated country, Japan's cultural evolution was slower, compared to Europe where cultural diffusion played a big role in their history. The examined nominations enable us to trace the formation and functioning mechanism of a concepts Japan and Europe. The analysis has proved that these concepts are forming with the help of means of discourse. It is based on the supporting conceptual bloc "common values", which is realized with the help of state constructions or the concepts "European integration", "European identity", "enlargement", "unique culture", "traditions" that have a rather narrow repertory of lexical representation.

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BODILY EXPRESSION AND FORMATION OF SUBJECTIVE QUALITY OF EMOTIONAL FEELING

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In fact all definitions of human emotions include two required components – bodily expression and subjective quality of feeling. Bodily expression is split-level, it contains excitations level, face expression, poses, specific reactions (such as crying, trembling, shaking, laughing) and emotional behavior (flight, defense, attack). There are two fundamental explanation of how these two components are related to each other.

Historically first was the theory of William James, according to which the bodily changes are followed directly by perception, and the feeling of these changes as they occur is the subjective quality

of emotion experience. However, researchers are still not able to reconstruct well reproducible relationship between specific bodily changes and at least one modality of emotions.

Another point of view was expressed by Stanley Schachter. He believed that the emotion arises as result of the combination of cognitive evaluation of stimulus and undifferentiated physiological arousal. Arousal provides intensity of the emotional feeling of any modality. The main reason for the differences in the modalities is the cognitive appraisal. This position was developed in numerous empirical studies. But the results of the studies are quite contradictory.

The first James's explanation argues that the subjective experience of modality depends on the feeling of bodily reactions to a stimulus. The second explanation (of Schachter) puts the relationship

between modality of feeling and specific bodily manifestations in dependence on the third factor – the cognitive appraisal. This position leads by the number of adherents and amount of empirical data. However, before we adopt it, it would be wise to check the possibility of not direct (as James believed), but indirect effects of bodily expression to the formation of the subjective emotional feeling.

James's basic thesis has been taken up in recent years in modern facial feedback theories. The research is focused on the emotion-arousing effects of facial expressions, some of it extended to the consequences of muscular movements in other parts of the body. It was shown, that facial expression induced by unemotional task facilitated smile led to funnier cartoons appraisal than in the case of inhibited smile (Stepper, & Strack, 1993). Head nodding (as in agreement) while listening to persuasive messages led to more positive attitudes toward the message content than in the case of shaking the head (as in disagreement) (Wells, Petty, 1980). The same results on the achievement test (above average) gave a greater sense of pride in those subjects who received the results with the straight back posture rather than subjects with the in-necks hung posture (Stepper, Strack, 1993, Duclos et al., 1989). Making a fist influenced automatic processing of words was found to be related to the concept of power (Schubert, 2004). Previously unknown Chinese hieroglyphs presented during arm flexion (an action associated with pulling an object towards oneself) were subsequently evaluated more indulgently than hieroglyphs presented during arm extension (an action associated with pushing an object away) (Cacioppo, Priester, & Berntso, 1993). In all these cases the bodily expression caused strengthening of feeling. However, change of expression can not remove feeling or replace it by another feeling.

All of these studies are limited to the examining of only one modality of emotions. For example the study of Stepper & Strack examined pride, but researchers did not consider that the results of the achievement test may have caused another feeling in the subjects, like anger against the examiner or sadness about the failure, or fear for losing position in university (subject were university students). I.e. outside the experiment emotionally significant stimuli generally cause numerous different feeling at the same time. Based on that we can suppose that the bodily expression has an indirect influence on what kind of emotion will be felt. Experimental non-emotional facilitation of bodily expression will increase the intensity of the feeling, manifestations of which coincide with the facilitated bodily expression. For example, if a person listens to

the message of a terrorist act, clenching his fists, he would rather feel anger than sadness or fear. If a person listens to this message in in-necks hung posture, he will feel more sadness than anger and fear.

This assumption was tested in our first study in the spring of 2011. Participants (84 Ss, 16 male, 68 female, 17–25 years old, $m = 19.8$) were told, that researchers were interested in the effect of the form of the activity (dynamic, static, and lack of activity) on the perception of a news item. They listened to the topics about the terrorist attacks in the Moscow subway and Domodedovo airport, which provoked feelings of fear, anger and sadness at the same time. During listening to the text they performed a task that involved taking a certain posture, perform actions, including those involving the facial muscles. There were 3 types of tasks corresponding to the bodily expressions of anger, fear and sadness. Each participant listened to one of the texts, performed one of the tasks and answered the questions. This procedure was repeated several times according to the number of texts and postures. Texts and tasks alternated in a random order. In the question part the participants were asked to rate on a 10-point scale 18 different emotions, which participants could feel in response to the events described in the text. 6 other questions regarded the appraisal of the behavioral responses that are typical for anger (e.g. to assign a degree of punishment), fear (e.g. «Please rate the extent of desire to avoid the use of an airplane or subway») and sadness (willingness to help the victims, donate money).

The results show that the texts did evoke the suggested feelings in greater extent than all other feelings, but these results were fairly weak (maximal $m = 3.3$). Variation of appraised behavioral responses typical for emotions was more pronounced (from 2.0 to 9.0 on 10-point scale). But in all cases when the tasks provoked bodily expression, they did not lead to facilitating of the corresponding feeling. Results were not different for the people who have (10 Ss, 2 male, 8 female) or have not experienced a terrorist attack. These results mean that the mere change in the bodily expression is not enough for feeling emotional change.

In the second study we used the varied level of arousal in addition to the procedure used in the first study. While listening to the texts participants heard a loud sharp noise. The noise was either expected or unexpected. This method is taken from the study of Ross, Rodin & Zimbardo (1969). Prior results suggested that bodily expression together with high arousal level do not lead to facilitating of a target feeling.

The paradoxical situation emerge, where emotional feeling doesn't depend on the perception of the bodily expression relevant to typical emotional display. We can explain this contradiction with the effect of cognitive appraisal studied by Schachter's at al. Integrate results and assumptions explaining this contradiction will be reported in presentation.

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THE COGNITIVE OPERATIONS OVER THE TEXTS

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The authors assert that the complete comprehension of various texts, both written and oral, presuppose the ability of humans to perform certain cognitive operations over the texts. These operations include semantic and pragmatic transformations of some fragments or utterances of the texts, generalization or specialization of different statements that may be present in the texts, clarification of different names and predicates, concretization of metaphoric and metonymic relations among the elements of the texts, etc.

Dealing mainly with mathematical texts and discourses, in particular with the formulations of the theorems, we aim at showing that the knowledge of diverse types that one can extract from them, is often transformed in some special way. The four cognitive operations over the mathematical texts are considered in detail; they are called the **specialization**, **designation**, **universalization** and **existentialization**. Each of them is applicable not only to mathematical material but also to fables, proverbs, laws, as well as to some other fiction and non-fiction domains. All the aspects of cognition that are associated with the operations constitute the essence and the kernel of the *text comprehension*.

All the four operations enjoy the common property: they are related either to the generalization of the particular statements or to the concretization of the general ones. The definitions are as follows:

- **specialization** – dropping the generality quantifier \forall or the corresponding quantifier words;

- **designation** – dropping the existential quantifier \exists or the corresponding quantifier words;
- **universalization**, or **existential generalization** – adding the generality quantifier \forall ;
- **existentialization**, or **existential generalization** – (adding the existential quantifier \exists).

Considering each of these cognitive operations we pay a special attention to the cases that are interesting from the mathematical, linguistic and cognitive points of view. All of them are especially important in the teaching and learning activities.

Specialization is a formal analog of the concept “particular case”. Among the various particular cases of a certain statement we pay special attention to the so called “degenerate cases”; this concept can be defined in terms of the specialization as well. There exists a series of examples in various domains that show that the conditions of its applicability are sometimes intricate.

Designation is performed on various stages of processing the expressions of the form $\exists x P(x)$ and their linguistic analogs. The two main types of the designation are distinguished – the direct and the indirect one. Their content and their application play an important role in the processing of the mathematical and other texts.

The two remaining operations – the universalization and the existentialization – are related to the generalizations of the particular statements. The input to each of these operations in most cases defines the result completely. The universalization and the existentialization are interrelated in various ways with the kinds of knowledge to which they are applied. The role of the communicative factor in the cognitive operations themselves and in their interpretation is sometimes quite important.

There exist certain text features that help to feel the close connection between the formal mathematical nature of the cognitive operations and their quasi-formal application to everyday oral conversations.

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STRUCTURAL EFFECTS IN THE WORK OF THE COGNITIVE UNCONSCIOUS: UNCONSCIOUS PRIMING BY MISSING STIMULUS

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Abstract. Is The Generation Effect possible at an unconscious level? In this study, we give a positive answer to this question. We have shown experimentally that the missing letter, in unconsciously perceived word-prime really increases the probability of choosing the same letter while solving the target task. In general, our results prove the possibility of active transformation and organization of unconscious information by the individual.

Keywords. Masked priming, The Generation Effect, unconscious cognitive activity

It is experimentally proved that at an unconscious level there is possible the complex analysis of coming stimulus, up to its semantic contents. It is fair in relation to stimuli of different modalities and characters, as well as to complex stimuli (words homonyms, dual images etc.). Besides, the unconscious easily “works” with series (numbers) of the stimuli coming successively or simultaneously. In the scientific use the idea of similarity of processes of information processing at conscious and unconscious levels was steadily fixed. However if it so what is duplication necessary for? What is a qualitative difference between information processing at conscious and unconscious levels? The main difference which first of all attracted researchers’ attention consisted in the possibility of regulation and control. It is obvious that conscious cognitive activity is in dynamic dependence on individual’s attention, his motives, intentions etc. while regulation of unconscious cognitive activity, at first sight, isn’t possible. There appeared a characteristic identification: unconscious cognitive processes = automatic cognitive processes, conscious cognitive processes = controllable cognitive processes. But how really

automatic cognitive processes are? The number of researches devoted to the so-called descending (top–down) effects, showed that unconscious cognitive processes turned out to be flexible and dependent on strategic and contextual influences (Whittlesea, Jacoby 1990; Smith 2001; McKoon, Ratcliff 1995; Bodner, Masson, 2001; Kiefer, 2007; Agafonov, Kudelkina, Vorozeikin, 2010.). However in overwhelming majority of similar researches the active nature of unconscious cognitive activity is generally reduced to quantitative characteristics (to regulation of intensity of unconscious stimulus influence depending on various conditions). But is activity concerning unconsciously perceived information is exhausted by the questions of quantitative regulation? Is the active transformation and organization of unconscious information by the individual possible? Are the mistakes, illusions, effects of generation, ignoring and other effects, connected with an active manipulation of the individual by coming information units, possible?

The present research is devoted to the search of the answer to this question. The purpose of the experiment: to define, whether unconscious fulfillment of the words as complete structural units of the experience on the basis of incomplete information is possible (Falikman, 2005). Can the word with the missing letter shown at the unconscious level be perceived as a whole and can it reveal the corresponding priming-effects in relation to the solution of the subsequent tasks? Words with the missing letter were used as unconscious stimuli-primers. There was an asterisk on the place of the missing letter (for example: be*). Words-metagrams were used as test tasks. These are the pairs of words which differ from each other in one letter, at the same time these words have no semantic relationship, e.g.: “bet” – “bed”. The example of a target task-metagrams: be*. Examinees weren’t informed that they were going to deal with metagrams and didn’t realize a duality of the shown target stimulus. The target task could be solved in three ways: 1. Reaction 1 (completion of the word-metagram to a word 1, for example “bet”).

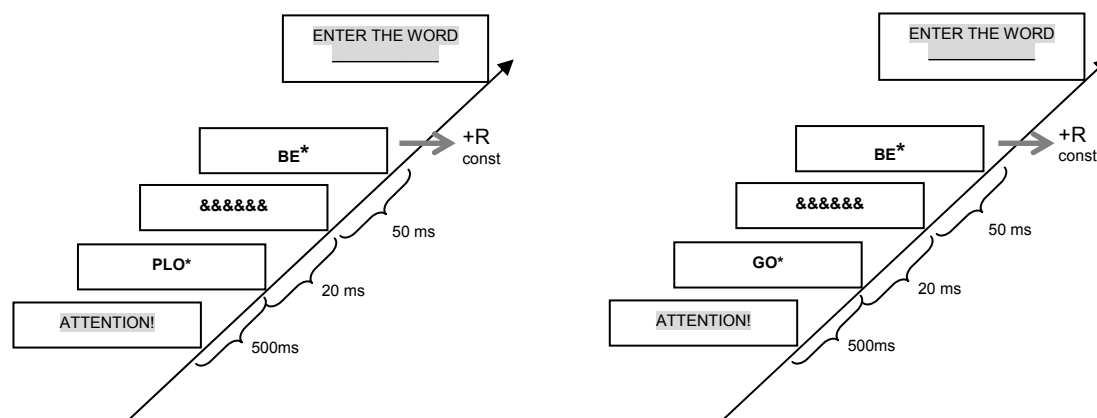


Fig. 1. Design of the experiment (experimental group 1 and 2)

2. Reaction 2 (completion of the word-metagram to a word 2, for example “bed”). 3. Completion to the other word (for example, to the name “Ben” etc.) Before each target task the word prime with the missing letter was shown to the examinee on the screen of the monitor. Conditions of the presentation excluded a possibility of its comprehension. The missing letter in the prime (which was replaced with an asterisk) acted as the help to a solving task. The word-prime wasn’t semantically connected with the target-word. The main question consisted in the following, whether the missing letter in a prime would increase the probability of completion of the target metagram to a word by means of the same letter. For example, whether the prime «plo*» will increase the probability of completion of target stimulus «be*» to the word “bet”, and the prime «go*» to the word “bed”? In details the design of the experiment is presented on fig. 1.

Results. The missing letter, in unconsciously perceived word-prime really increases the probability of choosing the same letter while solving the target task. It appeared true for 76% of stimuli at statistically authentic level ($p < 0,05$ by criterion χ^2). Therefore, the word-prime at unconscious level is completed to the whole word, and the letter

which was “generated” by the individual while completing the word-prime, tends to be chosen while completing the target metagram. The effect similar to the “effect of generation”, is possible at the unconscious level.

Conclusion. In the processing of unconscious information there are possible not only the effects connected with the change of the influence degree of this or that unconscious information, but also active effects of transformation of unconsciously perceived information.

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THE ROLE OF EMOTIONAL LABELING IN CATEGORIZATION OF INVERTED EXPRESSIVE FACES

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In most cases, we perceive numerous faces that surround us every day, as being oriented upright – that is, in their normal orientation with eyes in the upper half and mouth in the lower. Face inversion seems to disrupt the perceived holistic configuration of a face (Rossion 2009) and therefore declines our

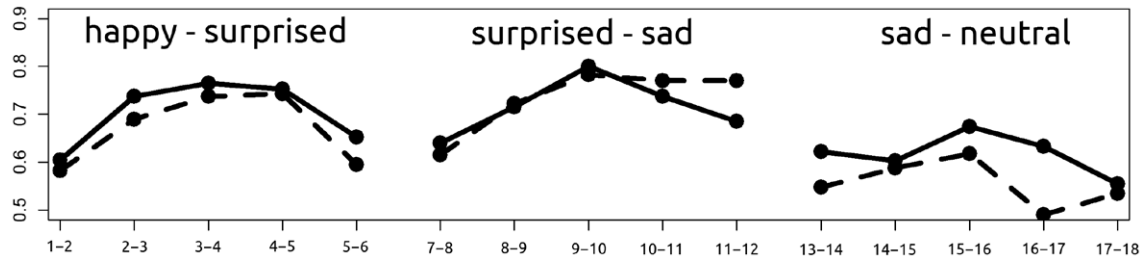


Figure 1. Discrimination functions for upright (solid lines) and inverted (dashed lines) series

ability to recognize both well-known and novel faces (Levin and Beale 2000). Moreover, upside down emotional faces, unlike upright ones, show no categorical perception (CP), at least for happy-sad and angry-afraid emotional continua (de Gelder et al. 1997). The CP phenomenon refers to enhanced ability to perceive dissimilarities in objects from different categories in comparison to objects belonging to same category, physical differences in both cases being equal. Studies of facial expression (FE) recognition under conditions of different orientation showed that along with FE recognized significantly worse while presented rotated, some FE can be recognized as well as when they are oriented upright (Barabanshikov and Zhegallo 2011). We tested discrimination ability on several upright and inverted emotional continua and the role of emotional labeling in their categorization. We hypothesized that impaired recognition (labeling)

of inverted FEs would significantly change the discrimination function.

Method. Stimuli. Four images of JJ from POFA database (Ekman 1993), depicting happiness, surprise, sadness and neutral FEs, were blended using linear computer morphing to obtain three continua of equidistant transitional images (happy-surprised, surprised-sad and sad-neutral, with 2 prototypes and 4 morphed images each). They were presented in between-group design in both upright and inverted orientation. **Procedure.** Discrimination task (ABX) included central fixation (600 ms), pair of 1-step test images (1500 ms), noise pattern (400 ms) and target image equal to one of the pair (1500 ms). The task was to decide which of the test images was presented as target one. Pairs from the three continua in four transpositions of A, B and X images were randomly presented five times each. Identification task included one centrally presented

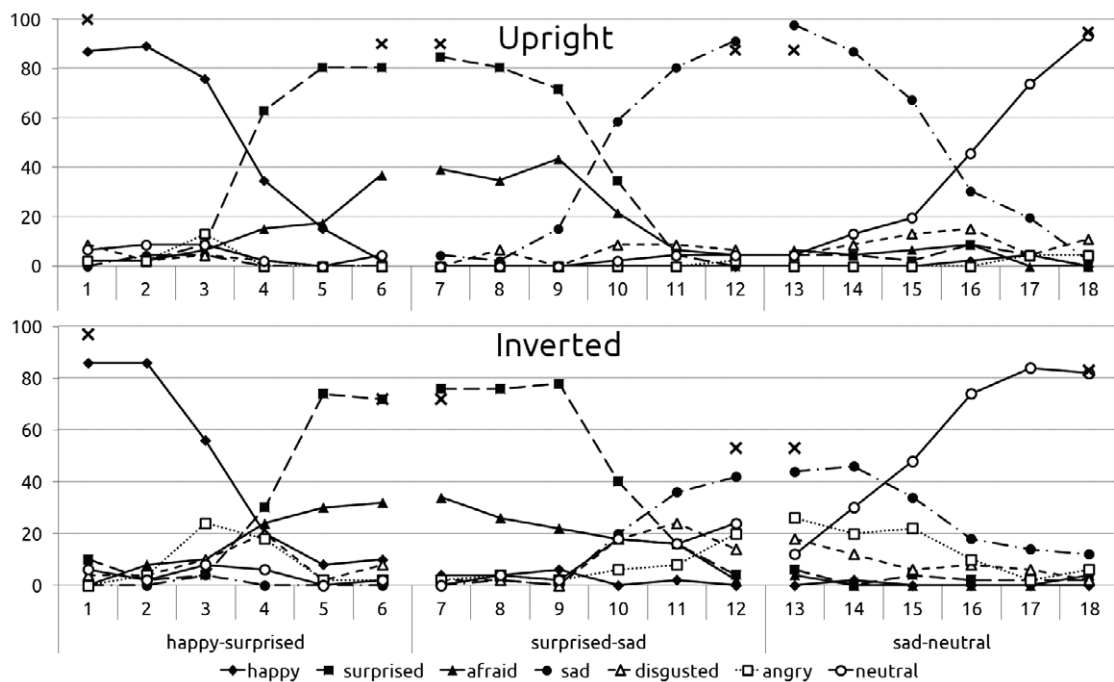


Figure 2. Identification functions for upright (upper panel) and inverted (lower panel) continua. The Xs show correctly identified basic FE (Barabanshikov and Zhegallo 2011)

image per probe (3000 ms) followed by the list of 6 basic emotions + neutral from which a participant should select one or several items describing the presented face. Each image was shown twice in random order. *Participants.* Moscow and Moscow Region students participated for credits in one of the four experimental series: DU – discrimination of upright (N=20, 3 m, age 18–42, median 25.5) and DI – of inverted (N=20, 7 m, age 17–40, median 25) faces, IU – identification of upright (N=23, 8 m, age 19–51, median 21) and II – of inverted (N=25, 7 m, age 19–53, median 22) ones.

Results. *Discrimination.* Using Pearson's χ^2 , we tested the non-uniformity of the discrimination functions for all FE continua in DU and DI series: all the differences were significant, but only on upright surprise–sadness the classical central peak was found. The comparison of the DU and DI performance showed significant differences only on sad–neutral continua (Fig. 1). *Identification.* For IU vs II series the differences for each emotion labeling function and each continua were tested independently, and the following showed significance: surprise, anger and disgust functions on happy–surprised; anger and sadness on surprised–sad; anger, sadness and neutral on sad–neutral continua (Fig. 2). Overall, in inverted continua, participants tended to identify more anger than in the upright ones (up to 20% answers on sad FE), and the correctly identified sad FE fell to about 40%; surprise was identified as fear in up to 30% in both orientations. The results obtained are consistent with the Barabanshikov and Zhegallo (2011) data (see Fig. 2).

Discussion. The question is debated, to what extent the CP phenomenon depends on perceptual

coding (Young et al. 1997) or verbal labeling (Roberson and Davidoff 2000) of the FE images. Also, there is data (Roberson et al. 2007) supporting the category adjustment model: that the CP for FE occurs through comparison of target and distractor images to the labeled and stored in memory FE prototypes. Though we did not observe strong CP (sharp central peak) on most tested continua, our data is in line with the labeling theory: on the continua that showed no inversion effect in discrimination, the identification functions maintained their S-shapes, whereas on the sad–neutral continuum with strong inversion effect, the proportion of correct identifications was half as much in inverted as in upright condition.

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THE ROLE OF MEMORY IN LANGUAGE PROCESSING IN INDIVIDUALS WITH FLUENT AND NONFLUENT APHASIA

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Our study is dedicated to the investigation of the relationship between language and memory. In order to explore this connection and determine its specificity we compared cognitive processes in people with aphasia with healthy adults. We assume that an impairment of one element will impact the state of the other one if there is a connection between these processes. Thus, numerous investigations showed that linguistic deficits in aphasia co-occur with the following nonlinguistic deficits: short-term memory (STM) and working memory (WM) deficits (Luria, 1947; Martin et al., 1996; Burgio, Basso, 1997).

The aim of our research was to investigate the differential role of STM and WM in language processes in individuals with aphasia. Data about the role of memory in different types of aphasia (fluent and nonfluent) were obtained for the first time.

The participants with aphasia were divided into two groups: individuals with nonfluent (connected with lesions of the anterior regions of the dominant hemisphere) and fluent (associated with lesions of the posterior part of the dominant hemisphere) aphasia. In general, persons with fluent aphasia have fairly preserved expressive language abilities, but difficulties in using of codes of the hierarchically organized language systems (phonemic, lexical-semantic, logical, and grammatical). Their speech may have many errors of word choice and articulation. Persons with nonfluent aphasia have severe difficulties with the production of speech: their speech rate is slow; it could be interrupted with meaningless phrases and words. Investigation of STM and WM in these two groups was an aim for exploratory analyses. A total of 33 participants (15 without aphasia; 9 with fluent aphasia; 9 with nonfluent aphasia), all native speakers of Russian were recruited.

All participants in the three groups completed STM and WM tasks. The following three tasks measured STM: *Forward digit span task*, *Word span task*, *Nonsense syllables*. WM was measured by *Modified listening span task (MLS)*, *Backward digit span task*. *MLS* is the modified version of the *Complex span task* of Daneman and Carpenter (Ivanova, Hallowell, 2011). In this task participants have to listen to sentences and memorize words. All sentences are semantically reversible (i.e., the roles of the agent and the patient may be reversed and the sentence still remains meaningful). Together with each sentence multiple-choice arrays are presented. Each array consists of four pictures. Only one picture depicts the presented sentence. Other pictures differ from the target one by an agent, patient, or action. Participants have to find the target picture. Words are presented after each sentence. Participants have to remember these words and at the end of the set they have to recall these words by choosing pictures depicting the presented words. The number of such pairs "sentence-word" increases from two to six items in a set. There are three trials for each set length (Ivanova, Hallowell, 2011). General language abilities are measured by the Quantitative Assessment of Speech in Aphasia (Tsvetkova et al., 1981).

Our results showed that performance on STM and WM tasks were significantly lower in persons

with aphasia compared to healthy controls (*WST*: $t(26) = 3.018, p = .006$; *NS*: $t(30) = 5.846, p < .001$; *FDSST*: $t(26) = 4.197, p < .001$; *BDST*: $t(26) = 4.664, p < .001$; *MLS*: $t(31) = 4.259, p < .001$, for descriptive statistics see Table 1).

Tasks	Individuals with aphasia (n=18), M	Healthy controls (n=15), M
<i>Word span task</i>	8,15	9,27
<i>Nonsense syllables</i>	0,31	0,55
<i>Forward digit span task</i>	4,54	6,67
<i>Backward digit span task</i>	2,92	4,80
<i>Modified listening span task</i>	0,84	0,94

Table 1. Means for STM and WM scores on all STM and WM tasks

The next experimental result is that more significant correlations were revealed between WM and language comprehension (7 significant correlations), than between STM and language comprehension (only 3 correlations). Thus, this result indicates the important role of WM in language processes in individuals with aphasia (Wright & Shisler, 2005)

An exploratory correlational analyses showed that the relationship between STM and language comprehension was not significant in both clinical groups; meanwhile the relation between WM and language abilities was different in these groups. Both clinical groups had similarly low scores on WM tasks, however the correlation between WM and language comprehension was significant only in persons with nonfluent aphasia. This data is comparable with an approach where WM is primarily associated with the executive control and attention processes, that are connected with lesions of the anterior regions of the brain (Cowan, 1999; Kane et al., 2008). Thus, WM may play the executive role in the processes of language comprehension for individuals with nonfluent aphasia.

Our study demonstrated that aphasia includes various nonlinguistic cognitive deficits and that there are specific connections between WM and language. This issue is very important for cognitive neuropsychology as well as for psycholinguistics, because of, on the one hand, it reflects specificity and relationships between different cognitive processes (language, memory, attention) and, on the other hand, demonstrates an internal organization of the language system, for example, differences between structures of paradigmatic and syntagmatic sides of language. In the future we plan to investigate spatial and verbal

WM in individuals with different types of aphasia in order to determine what aspects (storage vs. processing) of WM tasks and what modality (verbal vs. nonverbal) are impaired in fluent and nonfluent aphasia.

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ACCESS TO MULTILINGUAL INFORMATION: RESEARCH STRATEGIES TO BUILD THE CONTEXT OF INDEXING OF THE PRODUCER

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1. Introduction

The number of users search tools multilingual information has increased dramatically, so it is necessary to test the new Web tools and their relevance to the linguistic level to help the user find the required information in the desired language. This research represents a vision for web users, in terms of operational difficulties of the multilingual search tools. The work presented here is in the context of language (documentary linguistic and information retrieval). The study of the linguistic aspect allows to study the mechanisms of research tools in different languages. An analysis of texts (*French, English and Russian, etc.*) is a part of the language and systems of information processing. Access to digital data through web servers and databases is facilitated by search tools. Typically, the user visits the first page referenced in the list, but it does not consult the fiftieth. As it is difficult to assess to the document with the linguistic relevance of all references obtained, the researcher needs tools to filter the list of responses. The problem of information searching in texts is mainly a *linguistic* problem. The objective is to construct a system of automatic indexing that uses the model of *intensional predicate/NP*. Now we asked: *How to organize them in Documentary Indexing System for the future research of information?*

2. How to represent the linguistic data in information retrieval?

The problem with the search engines and the databases are generated the *noise* and the *silence*. A algorithm search is used to retrieve electronic documents on the Web. This technique leads to solutions noisy due to generic descriptors that reduce the relevance of documents. The interrogation of some bases using inverse files may give different results. In information science and libraries, the concepts of noise and silence are interspersed with relevant answers or non-relevant by a system for querying a database or library catalogs. One speaks of silence, when the answers are not relevant by the system of interrogation, but exist in the database. Noise is the set of the documents on a subject, returned by the database that are not relevant.

3. Linguistic representation: intensional predicate or noun phrase (np)?

The suggested interrogation schema are based intensional properties without reference to a fixed universe (*intensional logic*) or are referential functions linked well linked to well defined with the true value (*classic logic*)? This representation has to have the semantic characteristics of this document. It has been shown that the NP can be defined as a continuation of *free predicates* (Larouk, 1993) that is constructed around a name. The NP makes a direct reference to an extralinguistic element in a fixed universe as like in the following example. The extraction of NP is therefore determinate to be able to optimize an automatic indexing.

<1> /policy/; /economic/; /information/; /search/; etc.../ are [intensional predicates] /

The quantifier and the central *predicate* are vital for obtaining the NP. It is around a central

predicate the other neighborhood elements organize. It is represents by a name as in next examples:

<2> <NP>=< / The *policy* economic /> = / The (*policy***economic*) /
/ The _[quantifier] + *policy* _[intensional predicate] *economic* _[intensional predicate] /

The referential function is oriented towards the context or information statements (text data) are carriers of descriptions of objects (referents) to attract the attention of the recipient or applicant information. In the scientific literature, the descriptions are geared towards the objective reality in a world repository. In this context, the description language is used to support the idea, through its cognitive function. It is a tool to name the things and events but also to update them. These functions relate to the words simple and complex predicates inside of the sentence being updated referential.

4. Different schema of interrogation in space referential

This question has led to the following issues: – *What are the linguistic units that contribute most to the theme of the document and can be used to describe the contents of the document and to precise the question?* For Jakobson (1973, 1990), the context must be “likely to be verbalized or verbalized.” It has to be asked ie of well described and detailed views via the personal ideas, lexical clues, conditions influence the receiver, etc. The notion of mental space proposed by G. Fauconnier is determined by the expression language (textual). The terms set a new space with the elements within them and the relationships between these elements (G. Fauconnier, 1994).

In cognitive linguistics, where language is seen as part of carrying extra-linguistic reference, modeling is used to reconstruct the mental space of a producer of information (individual) or a group of indexers (intermediates) to communicate with an external user. As a cognitive model is always built, it can not be identical to the current range of phenomena that constitute the content of our mentality, where problems of text indexing and failure of information retrieval.

The next approach gives the choice between many research strategies to built the context of indexing of

the producer. The notions for *intensional_predicate*, *micro_NP*, *complex_predicate*, *macro_NP* are used to introduce the different navigation paths in different spaces. The schema illustrated a set of solution of the indexer (space cognitif) even of the most noisy (documentary system) and gives the choice to the user to satisfy his demand (request).

6. Conclusion

Information Retrieval which is known as documents is the process of locating and retrieving documents that are relevant to the user queries. In the case of an Information Retrieval, there is no correspondence between the set of reference (NP) that the user wants and the set of reference that the system is going to suggest to him. To limit the noisy/silence problem, we have to call the linguistic tools because, in the mid-ninety, a figure widely quoted set at just over 90% in the presence of English on the internet, so an index almost unilingual. Since the estimates for languages other than English have been increasing, and some analysts predict that the web will be largely non-English speakers with the rise of Chinese, Spanish, Russian, etc

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THE EFFECTS OF OVERT HEAD MOVEMENTS ON VALENCE IMAGE RECALL IN BULGARIANS

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Previous work has demonstrated that overt head movements can influence certain cognitive processes. For example, vertical head movements, associated with nodding, have been shown to lead to higher agreement when listening to both pro- and counter-attitudinal messages, in contrast with horizontal head movements, associated with shaking, which lead to lower agreement (Wells & Petty, 1980). This manipulation has produced similar effects in domains like anchoring & adjustment (Eppley and Gilovich, 2002) and product evaluation (Tom, et. al., 2006).

Apart from attitudinal effects, overt head movements have also been demonstrated to influence memory. Förster and Strack (1996) found that performing head movements while listening to valenced adjectives led to better recognition of positive adjectives for vertical head movements and better recognition of negative ones for horizontal head movements. Following their methodology, in this study we explore the influence of overt head movements on the free recall (rather than recognition) of valenced images. There were two main motivations behind this study. First, we wanted to see if this manipulation extends to memory for images. It is well known that people's memory capacity for images is much better than that for words (Shepard, 1967; for an old but good review of the literature, see Landauer, 1986). Hence, observing the same effect would be an interesting and non-trivial finding, further confirming the validity of the effect. Second, Bulgaria is a unique place to test this manipulation, given that nodding and shaking mean the exact opposite to what they mean in the rest of the world (shaking denotes agreement, whereas nodding indicates disagreement). Thus, the results would give insight into the extent to which culture mediates this effect.

Twenty-six participants were recruited to participate in what they were told was a marketing study to test the comfort and quality of a headphone set. Thirty positive and 30 negative images were selected from IAPS (Lang, et. al., 2008). They were selected for similar levels of arousal (approx. 5 on a 1–9 scale). The average valence of the negative and positive stimuli was approximately 3 and 7, respectively, again on a 1–9 scale.

The experimental design was a 2×2 mixed-model factorial comparing head movement (horizontal vs. vertical) between subjects and image valence (positive vs. negative) within subjects. Stimulus order was pseudo-randomized (same order for each participant) and each image appeared on a computer screen for 3 seconds. With music in the background, the set of 60 images was preceded and followed by a short blank slide. Half of the participants were instructed to perform vertical head movements while listening to the music and viewing the slideshow (presumably to test the sound quality of the headphones under more realistic conditions – during movement), while the other half performed horizontal head movements. They were instructed to maintain one head movement per second for the entire duration of the slideshow. Participants were also told to try to remember as many of the images as possible, as they would be asked to recall them later, after filling out a feedback form regarding the headphones (as part of the cover story). Following the learning phase, they were asked to write down all the images they could remember, listing each one on paper (test phase). They were given 15 minutes to complete this task, thanked for participating, and dismissed.

The average number of correctly recalled images was 20.04. On average, more negative (10.73) than positive (9.31) images were recalled for a main effect of valence, $F(1, 24) = 5.03$, $p < 0.05$. There was no significant main effect of type of head movements performed. Crucially, the interaction between head movement type and valence was significant, $F(1, 24) = 4.5$, $p < 0.05$. That is, more positive images were recalled by participants who performed vertical head movements (9.69), compared to participants who performed horizontal head movements (8.92). In contrast, more negative images were recalled by participants who performed

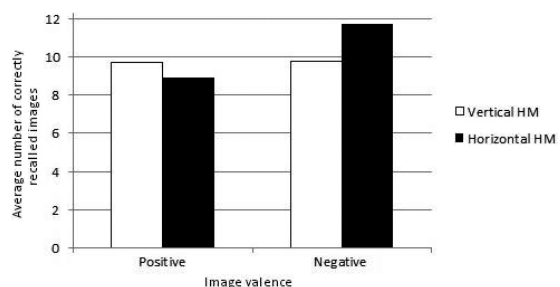


Figure 1. The average number of recalled images as a function of head movement type and image valence.

horizontal head movements (11.7), compared to those performing vertical ones (9.77; see Fig. 1). It is evident that the difference between vertical and horizontal head movements is greater for negative ($d = 1.14$) than for positive ($d = 0.4$) images. It is curious to note that this is the opposite of what Förster & Strack (1996) observed and leaves it up to further investigation to explore the underlying causes for this difference.

In summary, the results are intriguing and raise interesting questions for future research. Interestingly, the reversed meaning of head movements in Bulgarian culture seems to have no influence on the effect observed in previous studies. This may suggest that the effect is independent of culture, but it may also be due to the strong influence of Western culture (e.g., through media). This issue remains to be looked into in more depth.

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CAPITALIZATION AND TRANSFER OF PROFESSIONAL KNOW-HOW: DEVELOPMENT OF A MULTIMEDIA JOURNEYMAN SYSTEM FOR NOVICES' TRAINING

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Our research addresses the crucial and current issue of expert knowledge capture in the professional world. Because of its largely tacit nature (Nonaka & Takeuchi, 1995; Polanyi, 1958), hard to verbalize, knowledge is particularly difficult to access, capture, and share. Moreover, knowledge is situated and context-dependant (Lave & Wenger, 1993; Suchman, 1987), socially constructed within communities of practices (Wenger, 1998), and distributed between individuals, artefacts and world (Hutchins, 1991). We tried to take into account and overcome this multi-dimensional feature of knowledge. Thus, the present work takes place in a knowledge transfer problematic, involving particularities of tacit knowledge applied to industrial context. French industries, as many others countries are now confronted to a massive retirement of papy-boomer generation. By the way, this demographic transition is creating a sudden and urgent need for the transmission of tacit know-how. As made since decades, usual knowledge transfer is based on journeyman. This implicit intergenerational transfer needs one to one workers contacts and time to be achieved. However, both

conditions are now impossible to be satisfied, and this problem leads industries to solve differently the issue. This paper communication presents the results of a Research-Action (Lewin, 1951) work focused on the design of a methodology and an educational multimedia platform for the capture and transfer of professional explicit and tacit know-how embodied in professional gestures. This research-action was conducted in the main French company of energy sector.

On the theoretical level, we sought to understand, based on field data, the nature of the explicit and implicit transmission and formalisation of knowledge underlying the performance of professional gestures. For that, several categories of professional gestures were studied, and ten of them were investigated (Le Bellu & Le Blanc, 2011). This transdisciplinary approach takes the perspective of knowledge management, adopts an ergonomic posture and uses theories and methods coming from cognitive psychology and digital ethnography. The major theoretical frameworks mobilized are psychological Russian Activity Theory (Barabanshikov, 2007; Leontiev, 1978; Rubinstein, 1940) and Perceived Quality theory (Nosulenko, 1988; Nosulenko & Samoylenko, 2009).

On the practical level, we sought to develop an approach to situational learning of embodied

know-how by exploring the recourse to digital ethnography tools (Hollan & Hutchins, 2009). This aimed on the one hand, to perpetuate the knowledge linked to the gestures; and, on the other hand, to devise a method for the creation of structured, video-based educational supports. This practical phase has afforded the opportunity to test our models on real life cases, following the Experimental Reality paradigm (Lahlou, 2009). The triangulation (Campbell & Fiske, 1959) of technical, theoretical and methodological tools we applied has led to the design of several products.

We designed and combined a set of methods and techniques (Le Bellu, Lahlou, & Nosulenko, 2010): dual digital video capture with subjective first-person (Lahlou, 2011) and external perspective; situated goal-oriented verbalization protocol; self-confrontation and reconstruction interviews. They help recover the know-how in cooperation between analyst and expert. The method (1) aims at reconstructing the intentions of the experts; their mental models, and (2) to produce training video material for novices to learn and internalize the practice. Based on this method we realized a multimedia platform for the representation and transmission of professional know-how. This platform, called Multimedia platform for APprenticeship (MAP), was tested in an educational setting. It is based on decomposition and structuring of the gesture illustrated primarily by annotated video but also by means of functional schematics images, photos, etc. This decomposition results from the analysis of the gesture carried out upstream and based on Russian Activity Theory and Perceived Quality.

These two products, the capture method and the MAP, provide an operational chain intended for the trainers of the company's Training Division, for the capture and transmission of the tacit and explicit knowledge professional know-how. The incorporation of the MAP into the company's educational system, in real life training sessions, has been very positively evaluated and received by both trainers and trainees. The method is currently being industrialized throughout the company.

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AUDITORY INFORMATION PROCESSING, DORSOLATERAL PREFRONTAL CORTEX AND CORPUS CALLOSUM GENU IN NORM AND SCHIZOPHRENIA (A COMBINED P300, 1H-MRS, AND DTI STUDY)

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Introduction The relationship between brain structure and cognition is a key element in the mechanisms of mental processes in man. Also, it is of particular interest in the research of schizophrenia, a severe mental disorder with a core feature of neurocognitive anomalies.

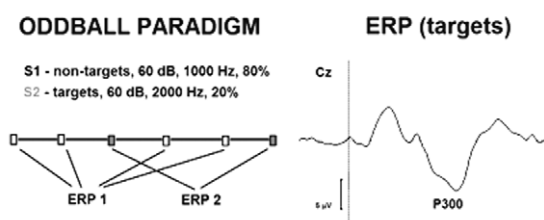


Fig.1 Auditory oddball paradigm (left), ERP to target stimuli averaged in the group of control subjects (right)

The present study was aimed to the analysis of relationships between auditory information processing in a selective attention paradigm and some structural and functional characteristics of prefrontal cortex (PC), particularly its dorsolateral area (DLPC), and corpus callosum genu (CCG). The former brain area has been chosen due to its known role in the supporting of executive functions

whereas the latter comprises the axonal fibers connecting PC of the left and right hemispheres.

Methods 22 right-handed male patients (21.6±2.9 years) with schizophrenia or schizoaffective disorder (F20, F25, ICD-10) were examined. The patients were in the clinically stable state, PANSS positive scores were 10.9±2.3; global scores –59.5±8.3. The control group comprised 20 age-matched mentally healthy right-handed males. All subjects underwent psychophysiological and clinical analysis, and 1H-MR spectroscopy. Eight subjects of each group also underwent diffusion-tensor imaging (DTI) analysis.

Stimuli presentation in the standard oddball paradigm and ERP recording were done with NeuroKM mapping system (Statokin, Russia) coupled with the audio generator (MBN, Russia). ERPs were sampled for 30 targets, P300 peak amplitudes and latencies were analyzed (Fig.1).

1H-MR spectra were acquired on a 3T Phillips Achieva (Holland) scanner using presaturation pulse and PRESS with TE = 35 ms, TR = 2000 ms. The voxel (20×15×10 mm³) was placed in the DLPC (gray matter of the middle part of the middle frontal gyrus) of the left and right hemisphere and in CCG (Fig.2). The ratio of N-acetylaspartate /H₂O (NAA) was analyzed.

The DTI images were obtained during the same session at the same scanner (DTI high iso, TE=60 ms, TR= 6589 ms, 0 mm gap, FOV 240 mm). Fractional anisotropy (FA) was calculated for CCG area (manual outlining) (Fig.3)

Results As compared to norm, the patients with schizophrenia had more prolonged P300 latencies in F3, F4 (t=2.4, t=2.8, p<0.05) and lower FA (F=8.05, p=0.014). NAAs in DLPC and CCG did not differ between groups and did not correlate with each other. In norm, NAA in the left DLPC correlated with P300 latency in T3 (r (Sp) = –0.61),

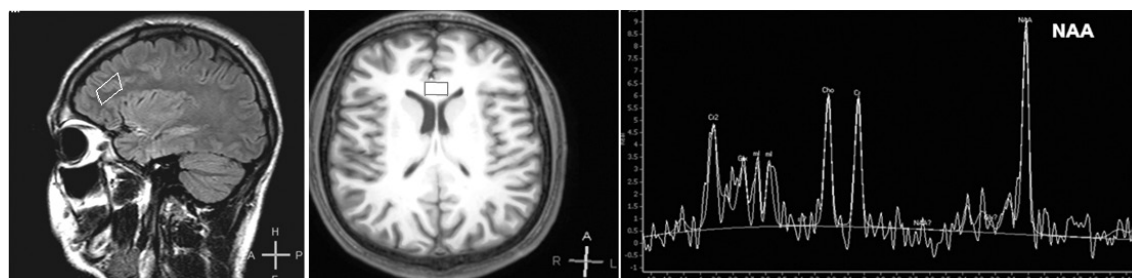


Fig.2. Voxel localization in DLPC (left), CCG (center) and obtained spectrum in CCG in one of the control subjects (right)

Pz (-0.55), NAA in the right DLPC correlated with P300 latency in F7 (-0.56) and P300 amplitude in F7 (0.58), T3 (0.69). In patients, there were no statistically significant correlations between NAA in DLPC and P300. There were no significant correlations between FA and P300 in norm, whereas in patients FA correlated with P300 latency in Pz (r (Sp) = -0.77 , $p=0.025$). There were no significant correlations between NAA in CCG and FA and between FA or NAA in CCG or DLPC, and PANSS scores.

Discussion In norm, the DLPC gray matter functionality as assessed by NAA was correlated with shortened temporal properties and increased synchronization and/or magnitude of the processes in P300 domain (working memory support among others). However, an impact of CCG white matter integrity on the tested markers of auditory information processing was seemingly negligible. In patients, there were no metabolic abnormalities in DLPC and CCG; white matter integrity in the genu of corpus callosum was impaired which was correlated with prolongation of information processing.

The findings emphasize the relative non-involvement of DLPC gray matter in the brain

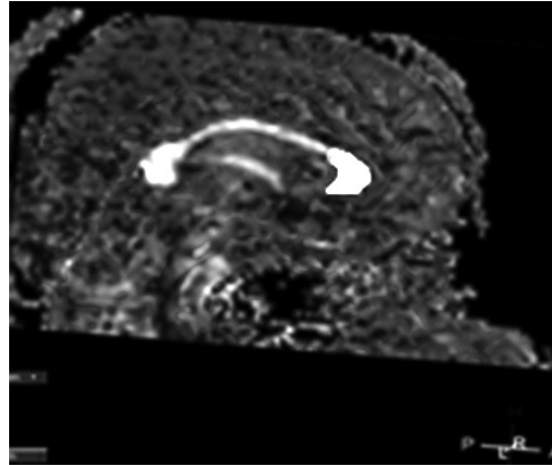


Fig.3. The region of FA analysis (white area) in one of the patients

circuits underlying schizophrenia psychopathology in the relatively young clinically stable male patients. The impairment of white matter bundles associated with prefrontal cortex merits attention and refers to dysconnectivity model of the disease.

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COLLATERAL EXPERIENCE AND INTERPRETATION: TOWARDS A NARRATIONAL ACTIVITY AS COGNITIVE INSTRUMENT WITHIN A PEIRCEAN SEMIOTIC APPROACH

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When it comes to the relation of language and thought, we are prone to be led to dichotomous thinking: linguistic relativity and linguistic determinism. Both hypotheses have been proven not to be persuasive; however, the influence of these perspectives is so cogent that our linguistic behaviors are restricted to those hypothetical ideas, showing either a mechanistic and passive attitude or a manipulative attitude towards language.

One of psychologists who proposed a hypothesis from a different perspective was a Russian psychologist L. S. Vygotsky. In his book, *Thinking and Speech*, Vygotsky took a semiotic stance in that language and thought are separate from their origin; however, they are mediated by the act of speaking, as conflating each other. Thus, while speaking, the speaker is mediated to thinking; while writing, the

writer is also mediated to thinking. Clearly, this view is related to a semiotic approach to language, as implied by Vygotsky's metaphoric expression: "consciousness is reflected in the word like the sun is reflected in a droplet of water." (1987:285) Therefore, the word is a sign; the sign is in man; thus the man is a sign according to C.S. Peirce (1960).

In this paper I will go further, observing how the linguistic structure can function, reflecting consciousness within a Peircean semiotic approach. Except for verbal thoughts, Jerome Bruner (1986) posited narrative as a mode of cognition. While arguing the narrative creation of the self, he stated that construction of the self was not only by language but also "narrative that shapes its use – particularly its use in self-making." (Bruner 2002:73) This view allows us to see microanalysis of language which is incorporated with a different semiotic system which comprises nonverbal dimensions, focusing on collateral experience and leading to narrational interpreting activity for communication.

Normally, language as symbolic sign is characterized by an arbitrary and relational, decontextual system; however, it is corporative with other types of signs, that is, the iconic and the indexical which are contextual and thus experiential in the action of sign by nature. From this aspect, the narrational activity in which two different thoughts are to be connected will be able to demonstrate how sign relation is operative in speech as for consciousness activity in the nonverbal and contextual dimension, in other words, how linguistic elements such as a word, a sentence, and discourse are cognitively constructed by narrational activity by means of looking at the Peircean symbolic signs: term, proposition, and argument, respectively.

In particular, the virtue of this semiotic-narrational approach to consciousness activity enables one to observe the process of how two modes of thinking, verbal and nonverbal, are integrated for generating and discovering meaning.

The feature of narrative has analogical structure in the system of language and semiotics in terms of the syntagmatic or syntactic aspect of structural elements. Specifically, the notion of 'transitivity' in both language and semiotic logic involves a cognitive process. However, my intention for the narrative mode of thinking covers emotion and cognition based on the Peircean semiotic, which will be iconic-indexical cooperative dialogic sign-action, which provides a semiotic agent with collateral observation and experience.

For the study on the communicative act, two specific topics will be investigated: One is a comparative study of sign and symbol and the other is symbolic inference by virtue of narrative dialectics. Having examined these two aspects, the communication model will be able to suggest an activity-based semiotic model, which I call 'activity semiotics', demonstrating the structural sign system with a non-semiotic aspect from agents' context, contributing to habit change for development of individual and culture and thus leading to evolution as a whole.

The background to the research involves looking into the relation of objective semiotic system and subjective psychological agent. Especially the

dialogic aspects between sign systems and the dialogical aspects between agents in the course of semiotic interpretative activity, that is semiosis, are the primary objects in examining the mental process in cultural community, which will extend to the realm of cultural psychology.

Eventually, narrational activity will be characterized by processual and pragmatic operation of cognitive activity, not for the language-user in a static symbolic system but for the sign-user as interpretant in an unlimited semiosis. This will be another way of looking at cognition, which is 'narrative cognition' as instrument for a more integrated method of discovering the meaningful life in a community.

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CATEGORIES AND CORPORA: A MULTIVARIATE CORPUS-BASED APPROACH TO SEMANTICS

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Introduction

Corpus-based models of natural language semantics are widely used to represent distributional memory (Baroni and Lenci 2010), organization

of mental lexicon (Divjak and Gries 2008), or to perform lexical human tasks (Landauer and Dumais 1997). Although their performance is often impressive, interpretation of their results in semantic terms is not an easy task (see Heylen et al. 2008). On the other hand, Cognitive Linguists still commonly use their own introspection as the gateway to meaning. However, the introspective method has been criticized as not (fully) reliable (e.g. Geeraerts 2010). This paper presents an innovative methodological approach to semantics, which is based on the representation of the exemplars of one or more linguistic categories, and which strikes the balance between the objectivity and interpretability. I show how the method works on a sample of Dutch causative constructions with *doen* 'do' and *laten* 'let'. The quantitative analyses corroborate the previous studies, which suggest that the difference between the constructions is related to (in) directness of causation. Nevertheless, it is not the only distinctive conceptual dimension. In addition to abstract dimensions, the method also allows one to identify the exemplar effects associated with specific lexical patterns (cf. Bybee and Eddington 2006).

Dutch causative constructions

The object of the case study are two Dutch causative constructions with the causative auxiliaries *doen* and *laten*. The difference between the constructions is a matter of a force-dynamic

construal (e.g. Verhagen and Kemmer 1997). The former verb is considered to be associated with direct causation, when there is no intervening force between the cause and the effect, as in (1):

- (1) *De aardbeving deed de muren trillen.*
the earthquake did the walls shake
"The earthquake made the walls shake."

In contrast, *laten* involves another source of energy in bringing about the effected event, as the gravity in (2):

- (2) *Ik liet het water weglopen.*
I let the water away-run
"I let the water drain out."

Data and method

The analysis is based on a sample from several geographically and stylistically diverse corpora of written and spoken Dutch. The instances of the constructions (exemplars) were manually coded for 35 semantic, formal and pragmatic categorical variables. The matrix with the exemplars (rows) and variables (columns) was then transformed into a matrix of distances between the exemplars with the help of Gower's universal distance metric. The matrix of distances serves as the input for multidimensional scaling, which allows for the representation of the exemplar space as a low-dimensional map. This map displays the relevant dimensions of semantic variation, 'senses' as

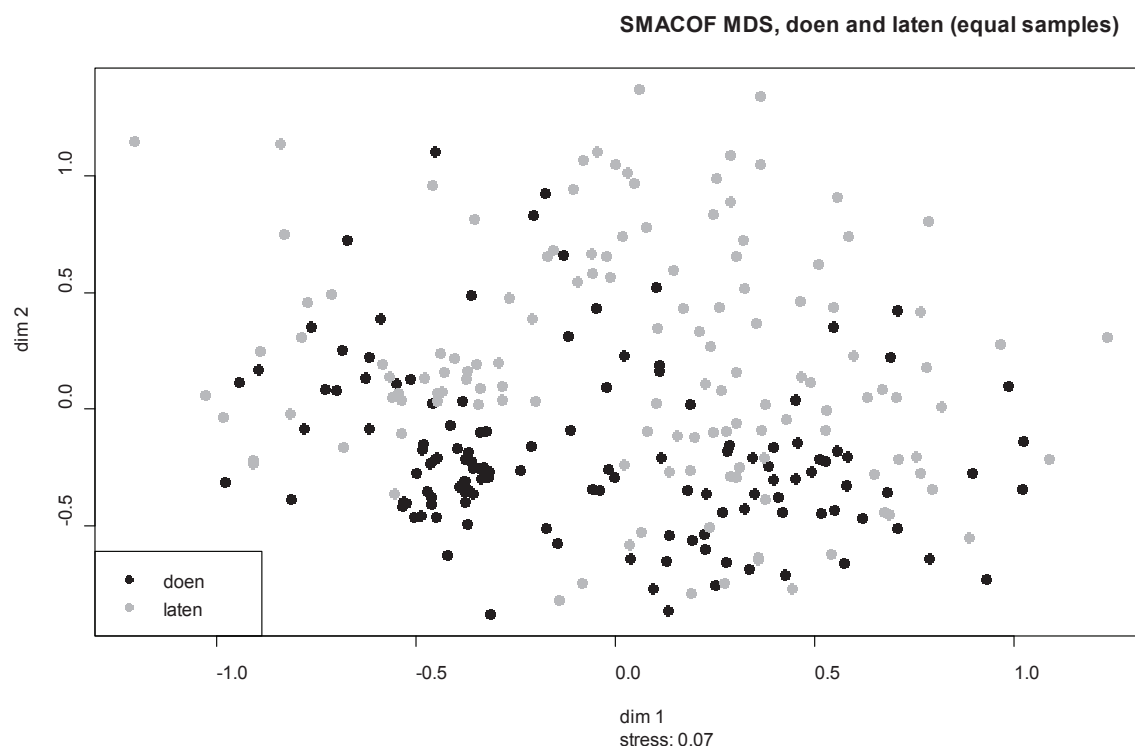


Figure 1. An exemplar space of the causatives with *doen* and *laten*.

clusters of closely located exemplars, and other semantically relevant information.

Results

A two-dimensional exemplar space of the two constructions is shown in Figure 1. After a series of tests, I found that the horizontal dimension corresponds to the distinction between mental and non-mental caused events, whereas the vertical dimension is related to the indirect and direct causation construal. Confirmatory statistical methods (e.g. logistic regression with mixed effects) showed that there are significant differences between *doen* and *laten* with regard to both dimensions. Moreover, there are outspoken exemplar effects associated with specific idiomatic patterns, such as *doen denken aan* “remind of” (see the dense cluster of the *doen*-exemplars in the bottom left part). The study thus adds new details to the previous analyses and provides a convenient tool for empirical Cognitive Semantics.

This research was funded by a grant from the Research Foundation – Flanders (FWO).

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MUCH ADO ABOUT KNOTTING: CONCEPTUAL STRUCTURE AND THE EMERGENCE OF THE LANGUAGE FACULTY

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In a series of papers, Uriagereka and colleagues (Camps & Uriagereka 2006 (CU) and Balari et al. 2011 (BEA), both of which follow Ch.7 of Uriagereka 2008) have advanced a novel way to locate the emergence of the language faculty in human evolution; one that is based on an analysis of the mathematical structure of objects found in the fossil record, including the corresponding computational machinery thereof needed to conceptualise/generate them. A knot is one such object, a type of artefact that is found in the binding of projectiles to their shafts. By connecting their discussion to Knot Theory (Knott), a subfield of mathematical topology that studies the mathematical characteristics of knots, CU claim that these objects can only be created/described by a context-sensitive system. In turn, BEA conclude that determining whether a string is knotted or not is of a computational complexity comparable to the processing of linguistic expressions. Given that evolution doesn’t, apparently, generate identical structures (C&U, p.45), the ability to create knots may be parasitic on the computational power of the language faculty. Furthermore, knots are not

found in the artefacts of the Neanderthals (ibid.), only in modern humans, and this would be another reason to believe that the appearance of knots may corroborate the stage in evolution in which hominids evolved a language faculty.

The overall argument, then, is clear enough. It is, however, an entirely fallacious one, predicated on a fanciful reinterpretation of mathematical linguistics, a misappropriation of Knott and a mistaken view of mental architecture.

A standard description from mathematical linguistics would state that (formal) grammars generate (formal) languages, while automata are those abstract computing devices that can *recognise* the generated languages (Hopcroft et al. 2007). Two hierarchies can therefore be outlined, one that ranks grammars and the languages they generate (the Chomsky Hierarchy; CH) and one ordering the automata that recognise the corresponding languages. The former is about expressive power, while the latter focuses on machines and their properties (memory, space, etc.). The expressive power of natural language is well-established, a fact about *weak generativity* (string generation). The linguist is, however, interested in structure generation, but *strong generativity* awaits formalization. Uriagereka (2008) reformulates the CH in terms of the different memory capacities

of different automata, applying its consequences, piecemeal, to a study of *competence*, even though this level of explanation abstracts away, by definition, from considerations of memory load. More importantly, he characterises automata as structure-generating machines (p.490), but this is not correct; automata are *recognising* machines. A fortiori, such a reformulation doesn't provide a formalization of strong generativity; not even a hint of it.

With this baggage, Uriagereka and colleagues confuse the computational complexity of a problem with the expressive power of a grammar; and hence, the misapplication of Knott. The latter is a rather narrow and technical discipline that has nothing to do with real knots; a mathematical knot is a closed structure, an embedding of a circle into Euclidean 3-space. Moreover, the main line of research focuses on working out which two knots are isotopic, where two knots are said to be isotopic if one of them can be transformed into the other by following step-by-step moves. This is called the knot recognition problem, and a special case of this problem concerns the so-called “unknot”, a closed loop without any knot in it, as shown on the left-hand side of Figure 1. The “unknotting” problem, in turn, involves specifying an algorithm that can recognise the unknot in a figure like the one found on the right-hand side.

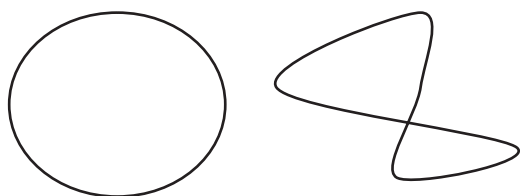


Figure 1. The unknot and a non-trivial knot

Naturally, none of this has anything to do with how you go about tying a knot, let alone the computational complexity required to do so. Nevertheless, BEA claim that ‘the task of determining whether any string is knotted is known to have a complexity comparable to the one needed to process linguistic expressions’ (p.11) and therefore ‘(un) tying knots (or determining whether a tangled string is knotted) seems to require an underlying computational system of Type 1’ (ibid., context-sensitive). There are two things at fault here. First is the claim that Knott involves ‘determining whether a string is knotted’, something that is clearly *not* the case, as Knott takes tied knots as its starting assumptions –indeed, Knott narrowly focuses on the equivalence problem outlined above. The other problem is to treat (un) tying a knot and

determining if a string is knotted as if they are equivalent, but there are no reasons whatsoever to believe so. Furthermore, the reference Balari et al. (2011) include in relation to all this (viz., Hass et al. 1999; cited therein) is clearly misrepresented. Rather, Hass et al. (1999) proved that an algorithmic solution for the unknotting problem is in the complexity class NP, which is to say that the algorithm will define multiple ways of processing the input without specifying which one it will take, in polynomial time. This has *no* relation to the context-sensitive expressive power of language; it also has *no* relation to the complexity of (un) tying a knot.

Nevertheless, this is not to say that (un) tying a knot may well involve a non-trivial computational system, and its study may profit from a biolinguistic perspective. It is not clear, however, that knot-tying has anything to do with the language faculty. What makes language special, after all, is the assembly of a computational system (CS), a set of lexical items, and the C/I and SM interfaces, but no more than conceptual structure seems required for knot-tying. An account of how (un) tying a knot proceeds might be something like this: external information would be transduced by the visual system into the mind, the information so gathered would then have to be conceptualised into the right mental particulars (the string concept, the knot concept, etc.), and a CS would combine these concepts into whatever structures underlie knot-tying (including the “plans” that would then be transformed into motor responses). That is, a grouping involving a CS, a set of concepts, and two interfaces (perception and motor skills). A corollary of this is that we should never come to believe that if a different cognitive domain makes use of *some* of the systems involved in language, it is *ipso facto* making use of intrinsically linguistic properties.

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SPATIAL COGNITION, SOCIAL BEHAVIOR AND OXYTOCIN LEVEL IN MICE WITH 'KNOCKOUT' OF THE CD38

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The nonapeptide oxytocin (OT) is synthesized in the paraventricular nucleus and supraoptic nucleus of the hypothalamus, and plays a critical role in regulating mating, pair bonding, maternal parenting behaviour, social recognition and other aspects of attachment in a wide range of mammalian species from rodents to humans. The transmembrane glycoprotein CD38 is required for regulation of social behaviour, particularly maternal behaviour, by stimulation of oxytocin secretion in mice through the activation of ADP-ribosyl cyclase, cyclic ADP-ribose (cADPR) production and Ca^{2+} mobilization. In the brain, CD38 is found in both neurons and glial cells, shows intracellular or plasma membrane location and is enriched in neuronal perikarya and dendrites.

Social cognition is the encoding, storage, retrieval, and processing, in the brain, of information relating to conspecifics, or members of the same species. Human beings are social creatures and social interactions have influenced the evolution of the brain. Approaches from neuroscience can reveal the mechanisms that underlie human competence in social interaction and communication. This can assist both in the understanding of such conditions as autism and in the development of artificial cognitive systems. Mice have been a popular study topic ever since scientists began to try to comprehend the human brain. Cognitive processes are invisible. However, we can measure their effects in behavior. One important approach to clarifying the functional roles of genes such as CD38 is through the phenotype of mice with gene deletion ['knockout']. Thus, phenotypic characterization of mice containing deletion of the CD38 gene may

inform on the involvement of this gene in OT secretion and in the expression of an autistic-like phenotype.

The role of CD38 in regulating OT secretion for social behavior has been demonstrated in adult mice and has been examined in pups during development. Separation from the dam induces stress in 7-day-old mouse pups. During such isolation, locomotor activity was higher in *Cd38* knockout (*Cd38*^{-/-}) pups than in wild-type (*Cd38*^{+/+}) control. The number of ultrasonic vocalizations was lower in *Cd38*^{-/-} pups than in *Cd38*^{+/+} pups. However, the difference between the two genotypes was less severe than that in OT knockout (*Oxt*^{-/-}) or OT receptor (*Oxtr*^{-/-}) knockout mice. To explain this, we measured plasma OT levels. The level was not lower in *Cd38*^{-/-} pups during the period 1–3 weeks after birth, but was significantly reduced after weaning (>3 weeks). ADP-ribosyl cyclase activities in the hypothalamus and pituitary were markedly lower from 1 week after birth in *Cd38*^{-/-} mice and were consistently lower thereafter to the adult stage (2 months old). These results showed that the reduced severity of behavioural abnormalities in *Cd38*^{-/-} pups was due to partial compensation by the high level of plasma OT. The dissimilarity between *Cd38*^{-/-} infant behaviour and those of *Oxt*^{-/-} or *Oxtr*^{-/-} mice can be explained partly by this exogenous source of oxytocin.

Our results suggest that secretion of oxytocin into the brain in a CD38-dependent manner may play an important role in the development of social behaviour. We used mice with CD38 gene disruption and show that CD38-dependent cADPR- and NAADP-sensitive intracellular Ca^{2+} mobilization has a key role in OT release from soma and axon terminals of hypothalamic neurons, with profound consequential changes in social behaviours. Alteration of CD38 function and the resultant disturbance of OT secretion may explain some forms of impaired human behaviour in the autism spectrum disorders.

METHOD FOR STANDARDIZATION OF TEXTS FOR AFFECTIVE STATES INVESTIGATIONS

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In most cases, psychophysiological studies of affect have been limited to stimuli evoking emotions related to single affective dimensions, e.g., disgust or fear (e.g., pictures, Bradley et al., 2001). These stimuli are often distinct from more

complicated content of everyday life of a person. Indeed, any simple stimulus takes place in different contexts of everyday life that may alter perception of its emotional content (Uryvaev et al., 1988; Uryvaev et al., 1991; Shapiro et al., 2001; Medford et al., 2005). Fewer researchers prefer to exploit stimuli with complex content, like films and texts. However complexity of such stimuli is a source of challenges related to their standardization. Indeed most of these complex stimuli (e.g., films) are holistic creative compositions, which content can not be easily composed from and decomposed to contextual elements.

Two main approaches for complex stimuli standardization or classification were offered: scaling stimuli by qualified professional experts such as psychiatrists (i.e., people skilled in the affect evaluation) via Consilium medicum or Delphi methodology and by “naïve” subjects with different social status, profession background and age via experience and appraisal scales (Rosenberg 1995; Bulut 2002; Ravaja 2004; Davydov and Lysenko 2002). Both approaches are highly utilized in psychiatric clinics to evaluate and classify patient’s state by clinician’s rating (Hamilton Depression Rating Scale) and patient’s self-rating (e.g., Beck Depression Inventory) scales and questionnaires. The latter approach has been wider utilized in stimuli classification, though its shortcoming is obvious: introspection in rating of affective content of complex stimuli in populations, which may be the target or comparison group for any follow-up experimental studies with these stimuli. Different strategies have been offered to improve classification by the latter approach (e.g., combination of two scores related to feelings elicited by stimuli: ‘discrete emotional ratings’ and ‘discreteness of emotional states’, Schaefer et al., 2009; Davydov et al., 2011).

Though the former approach of stimuli classification is less utilized, the role of psychiatrists as experts in evaluation of affective content cannot be overestimated. Their contribution could enlarge the diagnostic value of reactions to stimulus material. It was proposed that professionals could identify and classify affect in the complex stimulus content better than “naïve” subjects. Moreover, it would demand less sample size of raters for comprehensive stimulus evaluation compared to “naïve” subjects scaling approach. Method of texts evaluation by 16 clinical scales with the help of content analysis has been recently proposed (Gottschalk 1994; 1999), but it was found to be very complicated for cultural and language adaptation. Another method of texts standardization by clinical

experts in psychiatry was recently introduced by Davydov and Lysenko (2002).

In that study 14 psychiatrists appraised texts for depressive, anxious and aggressive contents ranging them according to degree of their intensity, using context for reassessment of affective words and phrases connotation. Data were analyzed using F-tests and Cronbach’s alpha. Each text was found to have variation in the main affect: one text was more aggressive and less depressive and anxious compared to the other two; the second was more anxious; the third was more depressive one. Recent experimental psychological and psychophysiological studies with these texts as stimuli have confirmed the detected differences in affective contexts of the texts shown respective differences of physiological reactivity and cognitive responses to these texts in “naïve” subjects (Lysenko and Davydov, 2011a, 2011b, 2011c). Thus, results of the prospective studies showed that expert’s appraisals were highly reliable to be utilized as a method of complex stimuli standardization.

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CULTURAL SPECIFICITY OF INTERNATIONAL AFFECTIVE PICTURE SYSTEM (IAPS): COMPARISON OF AMERICAN AND RUSSIAN SAMPLES

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Using universal standardized material helps to control influence of irrelevant variables and allows comparison of the data from different studies. Cultural specificity of these variables forced researchers to develop independent norms for different countries.

The most abundant in cognitive science of emotions database is International Affective Picture System 'IAPS' (Lang et al., 2008). IAPS consists of colored emotionally-evocative pictures from different categories. This database was created according to the dimensional approach to emotions. Each picture in this database has standard ratings on valence, arousal and dominance scales, which as it was shown in experimental studies influence variation of dependent variables (for a review see Bradley, Lang, 2007). Therefore it is of particular importance to take into account valence, arousal and dominance scores of pictures when designing an experiment. Moreover when the aim is to compare several stages of the study with two or more samples of pictures it is of special importance to equilibrate these samples along the above mentioned scales. IAPS is used worldwide in studies of emotions. Usually researchers from different countries assume cultural universality of these norms and use North American ratings in designing of experiments. But according to strong connections between emotion and culture one can expect cross-cultural variance of these estimates. Effort was made to compare North American norms with norms in different countries in order to show stability of IAPS. Ratings of valence, arousal and dominance in different countries highly correlate with American measurements which demonstrate IAPS stability (Bradley, Lang, 2007). In spite of the

fact that statistical methods used in cross-cultural studies of IAPS were not aimed (correlation analysis) or not sensitive enough (when mean ratings for all sample of pictures are compared) to find particular dissimilarities between cultures some substantial differences were discovered (i.e. Okon-Singer et al., 2011). Such cultural specificity is usually not taken into account by international researchers using IAPS and only North American ratings are continued to be applied in many studies. In this case inferences may not be reliable because of the probable uncontrolled cultural effect.

The aim of this study was to examine cultural universality of IAPS on a Russian sample. The H_0 hypothesis claimed that mean valence, arousal and dominance ratings for the Russian sample will not be significantly different from ratings of the general population (estimates of American samples treated as a general population). The alternative hypothesis H_1 claimed that these affective ratings will be significantly different between the two cultures. Differences between two samples will suggest importance of developing Russian norms for IAPS.

Pictures from International Affective Picture System were used in this study. According to an American study where 60 picture samples were used for each participant we selected 59 pictures, one of which was presented twice in order to check reliability of estimates. Eighty native Russian speakers participated in the experiment (40 women and 40 men; $M=20.4$, $SD=1.19$) as volunteers. The original instructions of IAPS were translated verbatim into Russian. Pictures appeared on a screen in a random order. Subjects were asked to evaluate each picture according to three 9-grade affective scales. They evaluated valence (pleasant or unpleasant) arousal (calm or excited) and dominance of experienced feeling. Mean valence, arousal and dominance ratings were calculated for each picture. Reliability of these affective ratings was examined by using split half method with application of the Spearman-Brown Formula.

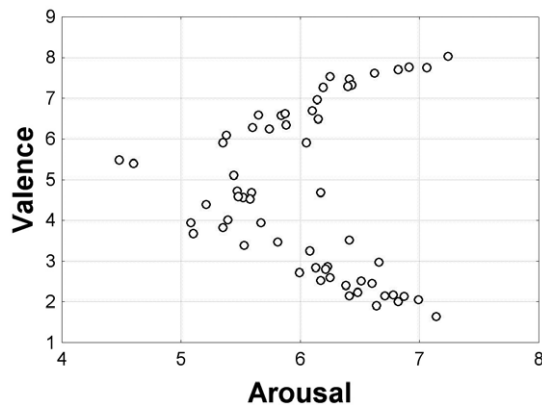


Figure 1. Two-dimensional space by Russian Sample. Means ratings for 59 pictures (n=80)

Reliability coefficients of these ratings were very high ($>.99$ for valence, $.95$ for arousal and $.97$ for dominance). There were significantly high correlations between North American and Russian scores ($r=.97$, $p=.000$ for valence, $r=.49$, $p=.0001$ for arousal and $r=.74$, $p=.0000$ for dominance). Affective space determined by valence and arousal dimensions had a boomerang shape as in the American sample (linear correlation between valence and arousal on Russian sample was $\rho=-.1649$, $p=.208$; Figure 1). It supports cross-cultural consistency of the affective space and that this method works on Russian Samples in a same way as it does in other cultures.

Student's T-test did not reveal significant difference between mean Russian and North American valence ratings ($t=-.41$, $p=.341$). Per contra, mean Russian arousal ratings were higher than American ratings in general ($t=-3.80$, $p=.0002$) and dominance ratings were higher in the Russian sample than in the American sample too ($t=-10.72$, $p=.003$).

Comparison of Russian and North American affective ratings for each picture separately showed

the following results. Valence scores for 29 of 59 pictures differed significantly between two samples ($p<.05$). Russian arousal ratings of 35 pictures differed significantly from American arousal ratings ($p<.05$). Moreover Russian and North American dominance scores of 57 pictures were significantly different ($p<.05$). Such strong difference between two samples for dominance as well as for the other two affective measures could not be considered as an artifact of the study. A high level of reliability coefficients as well as positive correlations with North American data demonstrates cross-cultural consistency of the method. Moreover in other cross-cultural IAPS studies around the world, dominance ratings significantly differ from North American ratings (Ribeiro et al., 2005).

Thus along with the stability of IAPS it has been shown that there are significant differences between North American and Russian valence, arousal and dominance ratings of pictures from this database. Cultural specificity discovered in the study proves importance of developing norms for Russian sample which are to be used along with American affective ratings in Russia.

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ERPS IN NORM AND SCHIZOPHRENIA DURING PROCESSING OF VERBAL INFORMATION

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Purpose: To analyze the parameters and topographical features of event related potentials

(ERP) components (P100, N170, P300, N400) into words and pseudowords in a situation of passive reading and during a lexical task in healthy subjects and schizophrenia patients (first episode of illness).

Participants: 30 healthy right-handed adults (15 men, 15 women) aged 20–47 and 32 patients (16 men, 16 women) aged 19 to 47 with a first episode of schizophrenia.

The experiment consisted of three series:

In the first series of the experiment subjects were reading presented verbal stimuli (words and pseudowords), in the second series they had to click a mouse button when words were presented and in the third part when pseudowords were presented. Stimuli: Each series of experiments included 160 stimuli (80 words and 80 pseudowords) of 5–6 letters each.

The procedure of the experiment: Stimuli were presented on the screen in random order for 100 ms. Interstimulation interval was 1500–4000ms.

EEG was recorded from 19 electrodes and amplified with Neuroscan Synamps. ERPs were averaged separately for words vs. pseudowords in the following time intervals: 105–155ms (R100/N100), 155–215ms (N170/R200), 235–310ms and 310–380ms (P300), 380–500ms (N400).

Data were subjected to repeated measures ANOVA, the nonparametric Mann-Whitney test for intergroup comparisons and the Wilcoxon test for intragroup comparisons.

Results:

Amplitude of the main ERP components was smaller in schizophrenia patients: **N100** (words: F3, $p<0.01$; F4, $p<0.05$, pseudowords: Fp1, $p<0.03$; Fp2, $p<0.03$; F3, $p<0.02$; F4, $p<0.05$; Fz, $p<0.03$), **P200** (words: F4, $p<0.004$; F8, $p<0.008$; Cz, $p<0.008$; pseudowords: F4, $p<0.02$; F8, $p<0.05$; Fz, $p<0.02$; Cz, $p<0.02$), **P300** (words: P3, $p<0.02$; T4, $p<0.02$; pseudowords: P3, $p<0.03$; F8, $p<0.01$; T4, $p<0.02$). This shows a deficiency of the neural mechanisms responsible for the processing of verbal information.

The main differences in the amplitudes of N100 and P200 components between healthy and schizophrenia were observed in the anterior brain regions, which conform to neurophysiological data on functions deficit of the frontal lobes in such patients (Schroder J. et al., 1995, Weinberger D.R. et al., 1994.).

According to our study the meaningful and meaningless information is processed differently in two groups. The results showed that in the healthy group, the amplitude of N170 increases on words in a situation of their relevance (O2, $p<0.05$) showing the “recognition potential” (Martin-Loeches M.), whereas in group of patients amplitude of N170 increases on pseudowords when they were relevant (T5, $P<0.04$). Thus, the patients had a paradoxical reaction, which may be associated with a deficit of the analysis of the structure of the incoming stimulus and selectivity deficit.

Effect of relevance was reduced in patients. In a group of healthy subjects words elicited more positive waveforms than pseudowords in the parietal regions in the situation of relevance of words (P4,

$p<0.02$; Pz, $p<0.004$ in the range 235–310ms, and Pz, $p<0.0002$; P4, $p<0.0001$; T5, $P<0.03$ in the range 310–380ms). In the group of patients there were no differences between the two types of stimuli (words and pseudowords) during 235–310ms in this series of experiments but amplitude of P300 was higher for words than for pseudo-words in the parietal region during 310–380ms epoch (Pz, $p<0.04$; P4, $p<0.01$).

In norm amplitude of P300 was higher for pseudowords than for words in the parietal location and in the frontal region of the right hemisphere when pseudowords were relevant (Pz, $p<0.005$; P3, $p<0.002$; F3, $p<0.04$ during 235–310ms, and Pz, $p<0.03$; P4, $p<0.05$; F3, $p<0.03$ during 310–380ms). In the patients group no differences between the stimuli in this series of experiments was found.

The effect of incongruence was found in both groups, pseudowords elicited higher amplitude N400 than words during passive reading (in healthy group: Fz, $p<0.02$; Cz, $p<0.01$; C4, $p<0.02$; F3, $p<0.01$, T5, $p<0.04$, in the patients group: O2, $p<0.05$; T5, $p<0.02$) and in a situation of relevance of words (in healthy group P4, $p<0.005$, in patients P4, $p<0.03$). However, when words are incongruent by task, they elicited stronger negative N400 wave in the parietal region of the right hemisphere, this effect was also observed in both studied groups (healthy group P4, $p<0.002$, in patients P4, $p<0.05$).

Conclusion:

The effects of selectivity and relevance are reduced in patients with schizophrenia in the early stages of the disease during the processing of verbal information, but the effect of incongruence remains relatively intact.

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MOTOR IMAGERY AND MENTAL REPRESENTATION OF ACTION: THE CONTRIBUTION OF CEREBRAL PALSY

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Introduction

Previous studies with mental rotation tasks involving either external objects (letters) or body parts (hands) have suggested that participants with Cerebral Palsy (PCP) present a general slow-down of imagery as compared to matched controls (Martins, Oliveira & Amorim, 2005). Other lines of research suggest, moreover, that PCP are impaired in their motor planning abilities (Steenbergen, Verrel & Gordon, 2007).

Motor Imagery has been described as a cognitive process in which the representation of action is internally reproduced while motor output is inhibited (Jeannerod, 2001).

Motion Extrapolation, the estimated time at which a moving target will reach a given location and Representational Momentum (the forward mislocalisation of the vanishing point of a moving target) have been suggested to rely on mental imagery (Munger, Solberg & Horrocks, 1999). A general slow-down of imagery should thus be reflected under this assumption on performance in both sorts of tasks, generally thought to involve ‘dynamic mental representations’ (Freyd, 1987; Munger *et al.*, 1999).

To test this, we had both PCP and matched controls to perform three kinds of tasks: mental rotation, representational momentum (RepMom) and time to collision (TTC).

Method

Participants

Forty CP participants (11–49 yrs) recruited at several Portuguese Cerebral Palsy Institutions and forty control participants with no record of any brain or motor impairment (11–47 yrs) participated in the study after giving written informed consent.

As inclusion criteria, PCP should (a) have no record of cognitive deficits or neurological parietal

injury; (b) be able to perform at a normal level on an adapted handedness test; (c) be capable of making an efficient use of mouse buttons as response keys.

Stimuli

1) Mental Rotation task

Realistic photos of human hands.

Two viewpoints were selected from among the ones used in Parsons (1994). The reference photos were rotated at steps of 30° between 0° and 180°, either away from the body medial-sagittal plan (lateral trajectory), either towards it (medial trajectory).

3D textured letters

Letters (F and R), 50% normal and 50% mirror-reversed, were created with 3DStudioMax and subsequently rotated at successive 30° steps, both in the rightward and leftward direction (between 0° and 180°).

2) Representational Momentum

Videos of a blue square (1 cm²) moving horizontally on a white background at constant speed. After traveling a variable distance (5, 10, 16, 20 and 24 cm) at different speeds (2, 8 and 16 cm/second), the square suddenly vanished, and a cross-shaped cursor appeared at the center of the screen. The squares could move either left-to right or right to left.

3) Mental Extrapolation – TTC

A similar video was presented on the screen. The blue square moved horizontally, either from left to right or vice-versa, towards a stationary barrier represented by a black vertical rectangle or a human silhouette (boy), and suddenly disappeared. We varied the speed of the square, the disappearance point and the distance from the edge of the screen from which the target emerged.

Procedure

The letters task required subjects to issue a “normal-mirror” judgment as quickly as possible by pressing corresponding mouse buttons (left/right).

The handedness task demanded a laterality judgment, expressed through pressing a specific mouse button (“left”- left hand, “right”- right hand).

In the RepMom task participants were asked to locate the cursor (using the mouse or a

track-ball) over the place where the target (taking its geometrical center as a reference) was seen for the last time.

In the TTC task, the participant was asked to press a button on the exact moment the vanished square would collide with the obstacle if he had kept moving.

Results and discussion

1) Outcomes of the Mental Rotation tasks replicated previous results (Martins, Oliveira & Amorim, 2005), arguing for the probable involvement of motor representations (and not just visual ones) in both mental rotation of external objects and of body parts. Both groups revealed a classic rotation effect on the letters task and similar patterns of biomechanical constraints on the hands task. The qualitative pattern (the phenomenology) of those constraints was shown similar in both groups. PCP revealed a general slow-down of imagery across both tasks;

2) Concerning RepMom, data are qualitatively similar in both groups and present a sort of graphical divisive pattern between target speed and target travelled distance, which has been already reported in the RM literature (Hubbard, 2005). However, the magnitude of RepMom is considerably larger in the CP group, especially for the higher target speeds.

3) In TTC, anticipation of the collision (underestimation of the target arrival time to the point of collision) was larger in both groups when the obstacle is a human silhouette than when it is a rectangle of similar size/area (with more anticipation found in PCP).

These results are at odds with the idea that a general slowdown of mental imagery would lead to a smaller forward mislocalisation error in

PCP. However, it is still compatible with the idea of an imagery which is slowed down in all its operations, such as the one of stopping-breaking a dynamic representation (as the “representational momentum”). Results from RepMom and TTC tasks cannot thus be used without further experiments to decide whether they reflect or not a general slowing down of imagery. By the same token, they cannot be used at this stage to support or detract the conjecture that mental imagery actually underlies dynamic representations.

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ARE BILINGUALS MORE FLEXIBLE THAN MONOLINGUALS? INVESTIGATING MECHANISMS OF COGNITIVE CONTROL AND TEMPORAL ORIENTING

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There is abundant evidence showing beneficial effects of bilingualism on cognitive functioning (Bialystok, Craik, Green, & Gollan, 2009; Costa, Hernández, & Sebastián-Gallés, 2008; Hilchey & Klein, 2011). The regular use of two languages has been found to enhance some aspects of executive control such as resolution of conflict among competing responses (Bialystok, Craik, Klein, & Viswanathan, 2004; Costa et al., 2008). However, the mechanisms of the so-called “bilingual advantage” are yet to be precisely described. The first aim of the present study was

to investigate in detail mechanisms of cognitive control in bilinguals, focusing on conflict processing and switching between categories. We also investigated different aspects of temporal preparation (i.e. switching between temporal intervals; Correa, 2010), as existing evidence suggests that bilingualism may influence even broader range of attentional processes, such as responding to warning signals (Costa et al., 2008). We compared young adult Polish-Hungarian bilinguals with Hungarian monolinguals on the three following tasks. The first task, which tested the efficiency of conflict resolution, involved two types of interference: stimulus-response interference (S-R, Simon), and stimulus – stimulus interference (S-S, spatial Stroop, see: Funes, Lupiáñez, & Humphreys, 2010). Two types of material were used: non-verbal (arrows pointing up and down) and verbal (words “up” and “down” in Hungarian). Bilinguals and monolinguals did not differ in speed or accuracy of conflict processing; however, the interaction between type of material and group revealed that while bilinguals were equally accurate when processing the two types of stimuli, monolinguals seemed to more accurately process the non-verbal stimuli. Secondly, we used a category-switching task, in which social stimuli (faces) were employed. Participants’ task was to categorize faces according to gender (female, male) or age (young, old) according to a simultaneous endogenous cue (i.e., a colored frame indicating which task to perform). Bilinguals were more accurate than monolinguals in the condition in which the largest task switching cost was present, i.e., when the same face was repeated (complete repetition of stimulus) but a different response was required. Bilinguals were also more accurate when the required response remained the

same as in the previous trial but the stimulus was only partially repeated. To investigate temporal preparation, we used a detection task with a temporal cue: a short line indicating that a target will appear early (after 400 ms) or a longer line indicating that a target would appear late (after 1400 ms). On 75% of the trials the cue correctly indicated the duration of the foreperiod (valid trials), whereas on the remaining 25% of the trials (invalid) the temporal expectation was not met (invalid trials). The results showed no between-group differences in the magnitude of temporal orienting effect. However, bilinguals showed more temporal flexibility, as they were less affected by the foreperiod in the previous trial. Taken together, the results suggest that bilinguals are characterized by increased flexibility of cognitive processing, which is applied to cognitive control (flexibility of switching between categories), as well as to other domains of attentional processing such as temporal preparation.

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EMBODIED MUSIC COGNITION

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The study of music in terms of embodied cognitive science (e.g. Gibbs, 2005; Varela et al., 1991) is a fairly new and deeply challenging idea. Considering the substantial amount of interdisciplinary research (as based on findings in empirical musicology, philosophy of mind, studies

on gestures and neuroscience (especially mirror neurons, e.g. Gallese, 2003), on *how the body shapes* the musical mind, in the following talk I aim to identify the key issues of recent works in the paradigms of (a) representationally based embodied music cognition (e.g. Leman, 2008) and (b) the enactive approach (e.g. Krueger, 2009), as opposed to traditional (computational, connectionist, disembodied) research on music cognition.

Music has always been connected with motor activity (Molnar-Szakacs & Overy, 2006; Altenmüller & Gruhn, 2002), whether it is (1) the production of music (involving well-coordinated

motor actions that produce physical sound) or (2) the experience of music (involving the perception of purposeful, intentional and organized sequences of motor acts as the cause of temporally synchronous auditory information). Thus, we should not think about the music-experiencing and motor activities of the body as separate. On the contrary, traditional (disembodied, computational, connectionist) research on music cognition (and on the musical mind itself) focuses on examining brain-music interaction, without taking motor activity into account (e.g. Balban et al., 1992; Todd & Loy, 1991; Jackendoff & Lerdahl, 1996). Consequently, explanatory problems with such approaches become apparent. To provide an example: orthodox computational approaches to (music) cognition treat action and perception as separate, and therefore they are unable to deliver a plausible explanation of the relation between music perception and movement (action). Moreover, due to neglect of (the active cognitive role of) the non-neural body, traditional music cognition is forced to use (conceptual) linguistic description for the non-conceptual content of musical experience (DeBellis, 1991). These problems, I argue, can be solved by understanding action and perception as interdependent; musical gestures can serve both as measurable “expressions” of interaction between musical experience (caused by perception of

music) and movement (action caused by musical experience).

I conclude with showing how the above and other problems of traditional music cognition (e.g. the communication of emotions by means of music), can be solved by recognizing the ways in which music cognition is embodied.

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VISUAL ATTENTION AND SWITCHING IN PATIENTS WITH MILD AND MODERATE TBI 1, 3 AND 6 MONTHS POST-INJURY

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Objective. Mild and moderate TBI – prevalent types of brain trauma – often lead to long-lasting cognitive deficits. Visual attention and switching – crucial for daily functioning – are frequently disturbed in TBI. Determining mechanisms of their disturbance can help in cognitive remediation planning.

Participants and methods. 43 adults (27 male, 16 female), 16–62 years old with mild (23 patients) and moderate (20 patients) TBI were tested within 1, 3 and 6 months after trauma. Trail Making Tests

A and B were administered to TBI patients. Time (T-scores) and number of errors were analyzed 1–3 and 3–6 months post-injury. ANOVA was performed. Only statistically significant results ($p \leq 0.05$) are reported.

Results. Trails A: significant decrease of time was seen between 1 and 3, 3 and 6 months post-injury. At 6 months post-injury time reached normal limits. Number of errors was minimal and no significant changes over time were seen. Trails B: significant decrease both in time and number of errors was seen between 1 and 3 months post-injury. Even at 6 months post-injury Trails B time did not reach normal limits.

Conclusion. According to our results visual attention improves within first 6 months of trauma. Switching improves within first 3 months of trauma.

DISTINCT PATTERN OF SEX DIFFERENCES IN CEREBRAL ACTIVATIONS DURING VISUO-SPATIAL PROCESSING AND EMOTIONAL MEMORY IN SCHIZOPHRENIA

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Background

Schizophrenia remains one of the most complex and obscure disorders of the central nervous system, with clinically heterogeneous presentation (symptoms range from hallucinations and delusions, disorganized speech and behavior, to social withdrawal, poverty of speech, avolition, anhedonia, and flat or inappropriate affect), high rates of treatment resistance (about 30%) and unknown etiology. There are important differences between men and women in the premorbid function, age at diagnosis, clinical expression, and response to treatment in schizophrenia (Leung and Chue 2000, Abel et al. 2010; Mendrek and Stip, 2011). Although these differences have been well documented, we still know very little about their underlying mechanisms. Thus, over the past few years we have established a research program devoted to examining neurocognitive, hormonal, and psychosocial factors implicated in gender differences in psychoses. Our work to date revealed an intriguing reversal of normal sexual dimorphism in visuo-spatial processing and associated brain function in clinically stable schizophrenia patients. Specifically, the task involved mental rotation of three-dimensional (3-D) figures and elicited superior performance in healthy men relative to healthy women (replicating previous studies in the general population), but the opposite effect was observed in patients (i.e., women performed better than men; Jimenez et al. 2009). In a similar manner, functional magnetic resonance imaging (fMRI) data showed greater activations in healthy males relative to females (mainly in the parietal and lateral prefrontal cortex), but the opposite pattern in patients (Jimenez et al. 2010). In the present study we examined data obtained in the same cohort of subjects during performance of an emotional memory task, to find out if the sex difference observed during visuo-spatial processing reflected a generalized neurocognitive/neurofunctional deficit in male patients.

Methods

42 schizophrenia patients (21 women) and 42 healthy controls (21 women) matched for age, handedness and parental socio-economic status underwent fMRI while performing an emotional memory task. All patients were in a stable phase of their illness, treated with atypical antipsychotic medications (olanzapine, risperidone, quetiapine, clozapine). The task consisted of the recognition of complex photographic pictures (scenes, faces, objects etc.; selected from the International Affective Picture System – IAPS) that were emotionally positive, negative or neutral. One half of the images were never before seen by the participants, while the other half was seen 15 minutes earlier during incidental encoding condition. The participant's task was to indicate if the presented picture was 'old' or 'new'. The behavioral data (performance accuracy and reactions times) underwent factorial 2 by 2 (group by sex) analysis of variance (ANOVA) for each affective category, while the fMRI data were analyzed using the statistical parametric mapping software (SPM5).

Results

The analysis of behavioral data revealed the main effect of group but no main effect of sex. Thus, overall patients performed significantly worse than controls on recognition of all affective conditions (positive, negative and neutral), but there were no sex differences (in either condition). The fMRI data analysis showed significantly stronger activations in healthy women relative to schizophrenia women in a few circumscribed regions of the visual and parietal cortex. In contrast, in the male participants it was the group of patients that showed significantly more activations in the bilateral superior and middle temporal cortex, as well as bilateral inferior parietal and supplementary motor area.

Discussion

The results of the preset study point to a small decrement in posterior cerebral activations in female schizophrenia patients, and augmented activations in the bilateral temporal and parietal cortex in male patients, relative to the same sex-controls, during recognition memory task. These results are puzzling (particularly in the light of equal performance between male and female patients) and require further investigation. Interestingly, the sex differences in patients' cerebral activations were in the opposite direction to what we have observed during mental rotation

in the same cohort of participants. Altogether, this atypical sexual dimorphism in brain processing in chronic schizophrenia patients (which has now been observed during both visuo-spatial and emotional memory tasks) suggests that brain processing in male schizophrenia patients may be feminized/de-masculinized, while brain processing in female schizophrenia patients may be masculinized/de-feminized. This effect may appear due to faulty organizational and/or activation effects of sex steroid hormones (Mendrek 2007; Mendrek and Stip 2011). This hypothesis deserves further exploration at the illness onset, as well as in the individuals at the augmented risk to develop schizophrenia spectrum disorders, as it may have important implications for revealing differential etiology and endophenotypes of psychosis in men and women.

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LIMITS OF COMPUTATIONAL EXPLANATION OF COGNITION

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In this talk, I want to focus on cognitive phenomena that cannot be explained computationally. From the very beginning, research on Artificial Intelligence had two goals: create artificial cognitive systems and explain the behavior of natural cognitive systems in the same way the artificial systems are explained. The second goal was based on the assumption that artificial systems are good models of natural ones, and that means that they share the relevant causal organization that underlies their behavior (for an early expression of this view, see Craik 1943). Yet, early AI systems were usually created without much theoretical analysis beforehand, and the enthusiasm for them could not be easily justified, especially in the areas where human cognitive behavior seemed much more flexible than rule-driven processing of symbols. The computational approach to cognition was criticized exactly for this reason (Dreyfus 1972).

All similar criticisms notwithstanding, computational explanation of cognitive systems remains the core of cognitive science, even in the enactive research program, and many dynamical accounts of cognition share most important assumptions of computationalism. Computational models abound in neuroscience.

I argue that some aspects of cognitive phenomena cannot be explained computationally.

In the first part, I sketch a mechanistic account of computational explanation that spans multiple levels of organization of cognitive systems (Piccinini 2007, Milkowski forthcoming). In the second part, I turn my attention to what cannot be explained about cognitive systems in this way. I argue that information-processing mechanisms are indispensable in explanations of cognitive phenomena, and this vindicates the computational explanation of cognition. At the same time, it has to be supplemented with other explanations to make the mechanistic explanation complete, and that naturally leads to explanatory pluralism in cognitive science.

First of all, mechanistic explanation (Machamer, Darden & Craver 2000) of a phenomenon does not explain the bottom level of a mechanism, i.e. its parts and their organization. There might be an explanation of why they are organized this way and not another, and why they are what they are, but this is not a part of the same explanation. Most importantly in this context, this means that one cannot explain the makeup of parts that constitute a computational system. In other words, if they play any role in cognitive phenomena, one needs to explain their contribution. This contribution will however be (most usually, with a possible exception for multiply nested virtual machines) non-computational. An obvious example is that the speed of a machine depends not only on its algorithms but also on its hardware capacities. The relevant hardware capacities of a transistor-based machine cannot be explained computationally. Yet,

obviously, the processing speed does influence the cognitive performance. In other words, not all time-related aspects are explainable computationally (even if reaction time is one of the main experimental data used to test hypotheses about computations).

Similarly, the top level of mechanistic explanation, the contextual level, may itself be not computational. At this level, however, one may explain system goals and autonomy (e.g. in terms of feedback, Bigelow, Rosenblueth & Wiener 1943) but such an explanation will require references to environment that is not a part of this mechanism. If the mechanism and its environment is not a part of another computational mechanism (that is, if the mechanism is not nested in another computational system), such an explanation, even if in purely causal terms, will be non-computational. This also is one of the reasons why meaning externalism was opposed so long, though it actually complements computationalism rather than denies it (McClamrock 1995). In other words, representation, if it is explained essentially not only by the way it is encoded (which is encodiginism, criticized by Bickhard & Terveen 1995), but also by the interaction with the non-computational environment, is not a computational phenomenon either.

I will conclude my talk by defending explanatory pluralism in cognitive science, which includes

computational explanation and other empirically and theoretically sound explanatory strategies. By drawing on several examples from classical and recent research, such as cryptarithmic (Newell & Simon 1972) and cricket phonotaxis as explained using robotic models (Webb & Scutt 2000), I will show to what extent they already presuppose explanatory pluralism, and at the same time, use computation to explain cognition.

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INDIVIDUAL VARIABILITY IN BRAIN ELECTRICAL ACTIVITY IN CARRIERS OF DIFFERENT COMT AND BDNF GENOTYPES: HIGH-DENSITY ERP AND SNP STUDY

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The variability in cognitive functions can be partially explained by genetic differences which lead to variable brain neurochemistry. Cognitive processes depend on multiple substances in the brain, thus multiple genes influence performance of the cognitive tasks. Investigating a correlation between certain gene polymorphism and brain electrical activity during a cognitive task may shed light on the mechanisms of brain function, especially, if a large sample size makes it possible to check the joint influence of several genes.

According to the literature, single nucleotide polymorphisms (SNP) in the genes coding brain-derived neurotrophic factor (BDNF) and catechol-O-methyltransferase (COMT) may both have an impact on individual variability of cognitive functions, i.e., performance in the working memory tasks, attentional control, anticipation, etc. There are also reports on correlations of SNP of these genes and ERP components, like P300 (e.g. Schofield et al. 2009, Yue et al. 2009). However, the reports are controversial.

We aimed at studying individual differences in brain electrical activity elicited by the warning stimulus (CUE) preceding different types of pictures in two visual tasks with similar design. We supposed that the implicit learning took place during this anticipation period: the meaning of the CUE was not explained to the participants, however, there were changes in both visual response to CUE and slow wave related to the picture category. We were

interested how the BDNF (Val66Met) and COMT (Val15Met) polymorphisms account for variability in the characteristics of the ERPs in healthy volunteers: the general pattern of evoked activity and specifically the changes due to implicit learning. Total of 93 young adult volunteers took part in this study: with several exceptions, they have done both tasks. SNPs were identified for BDNF (G to A substitution at rs6265) and for COMT (G to A substitution at rs4680). In both, G to A substitution results in valine to methionine substitution in the final product.

In the first task (EF), the instruction was to press button 1 for a human and button 2 for an animal face. Half of the images in either group were neutral and half were showing aggressive people or animals (aggression/treat directed to the observer). The evoked activity was averaged for 4 conditions: HN – human neutral, HE – human emotional, AN – animal neutral, AE – animal emotional. In the second task (FF), the instruction was to press button 1 for a human face and button 2 for a non-face object. The evoked activity was averaged for 4 conditions: WB (attractive face), WU (non-attractive face), BF (butterfly), FL (flower). In both tasks, each of 4 types of pictures was preceded by the CUE stimuli – simple geometric patterns, unique for each category of pictures. The pictures were monochrome photographs, with no repetition through the recording.

128-channel EEG was recorded with 500Hz digitization rate (Electrical Geodesics Inc. system) and low-pass filtered offline at 30Hz. The EEG was segmented and averaged from the CUE onset to the picture onset (the duration was 2 s). Responses elicited by the CUE and the following slow wave (CNV) developing during the anticipation of picture were analyzed in the carriers of different genotypes.

At the first step, we analyzed SNP-ERP correlations separately for COMT and BDNF genes. For COMT, the Met/Met genotype produces a less active enzyme, resulting in higher dopamine levels than the Val/Val, heterozygotes Val/Me1 show intermediate enzyme activity. We selected participants homozygous on Val and Met genotypes. For BDNF, valine to methionine substitution has been associated with altered intercellular trafficking and regulated secretion of BDNF in Met compared to Val carriers. We had only 2 participants with Met/Met genotype, and the analysis was done for Val/Val genotype versus Met allele carriers. In general, both SNPs influenced brain activity in 200–400 ms range as well as slow waves. The effects were larger for COMT than for BDNF, larger in EF task as compared to FF task, and more prominent in the posterior regions of the scalp, especially for the 200–400 ms window. This may be due to the fact,

that emotional faces were used in EF task. Also, COMT-effect was observed mainly around 300 ms, and BDNF-related differences were at 200 ms and in some degree also in a component with a peak latency at 150 ms.

At the second step, we analyzed possible joint effects of both genes on brain electrical activity. We compared Val vs Met homozygotes for COMT gene only in Val/Val carriers for BDNF gene, and separately in Val/Met carriers for BDNF gene. Category-related dissociations in ERPs were seen in almost all participants (implying the learning to associate the CUE and definite picture type), however they were clear and robust in the carriers of Met/Met for COMT and Val/Val for BDNF (Fig.1).

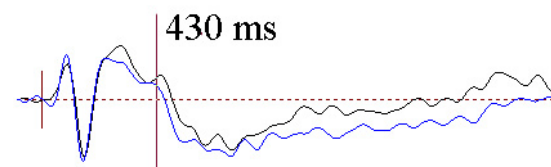


Fig.1 Channel 15 at middle prefrontal scalp location. ERPs are shown from 100 ms prior to CUE onset to 2000 ms for the group with Met/Met COMT + Val/Val BDNF genotype. Black is for HN and blue is for HE conditions (differential anticipation of pictures).

This group also had the largest P220 and N600 components in posterior regions, compared to others except for the group having Val/Val on COMT and Val/Met on BDNF. Surprisingly, this group also had large P220 component, and distinct P430 wave, observed also in other groups with smaller amplitude (Fig.2). This type of analysis seems to be more beneficial for SNP-ERP studies, showing more robust effects for ERP components.

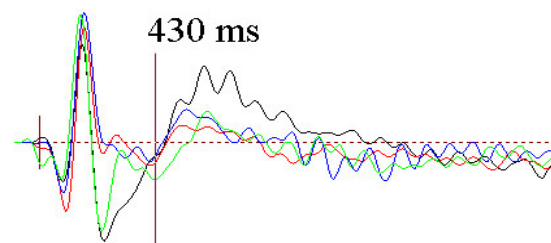


Fig.2. ERPs for channel 65 (approx T5 in 10–20 system) in EF task, condition HN, are shown from 100 ms prior to CUE onset to 2000 ms. Black graph is for Met/Met COMT + Val/Val BDNF genotype, red graph is for Val/Val COMT + Val/Val BDNF, blue is for Met/Met COMT + Val/Met BDNF, and green is for Val/Val COMT + Val/Met BDNF.

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ANALYSIS OF SACCADIC LATENCY AT DIFFERENT CONDITIONS OF VISUAL STIMULI PRESENTATION TO THE DOMINANT AND SUBDOMINANT EYE

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The stimulus choice as a saccadic target includes inhibition of other possible answers, the ones which are meaningless for the current behavior. This process is preceded by the latent shift of attention. The simultaneous presentation of target and distracting visual stimuli is an experimentally controllable analogue of behavior revealing the significant information by visual system, orientations to it and simultaneous inhibition of impellent activity on insignificant one. The objective of this study was to estimate dependence of saccadic latency during stimulation of the dominant and subdominant eye in various conditions of presentation of target and distracting stimuli.

10 healthy right-handed volunteers participated in the study. Target and distracting peripheral visual stimuli were presented simultaneously monocularly on the monitor in various spatial combinations. Eye movements were recorded using the electro-oculogram.

Visual stimuli (target (T) and distracting (D)) were presented in same or in different visual hemifields at the distance 5, 15 or 20 degrees. As a T we used a circles, as a D – daggers. In 50% of cases target stimulus was presented in the place of previous presentation of target stimulus, in 20% – in the place of presentation of distracting stimulus, in 20% – in new place and in 10% of cases target stimulus were presented without distracting ones.

In most subjects, saccade latency was shorter by 10–30 ms for the presentation of stimuli to the dominant eye ($p < 0.05$), but in grand averaging this difference became not visible. Mean latency of correct saccades increased when target and

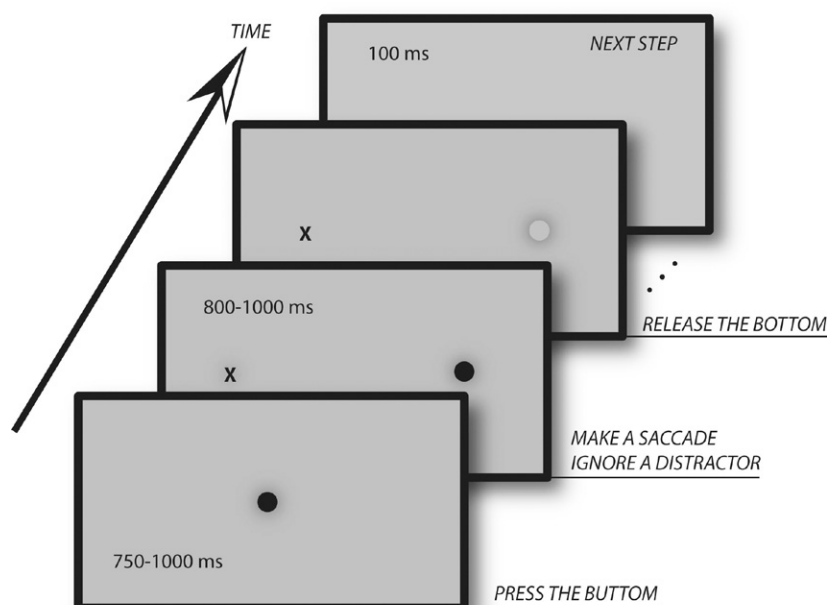


Fig. 1. The scheme of visual stimulation

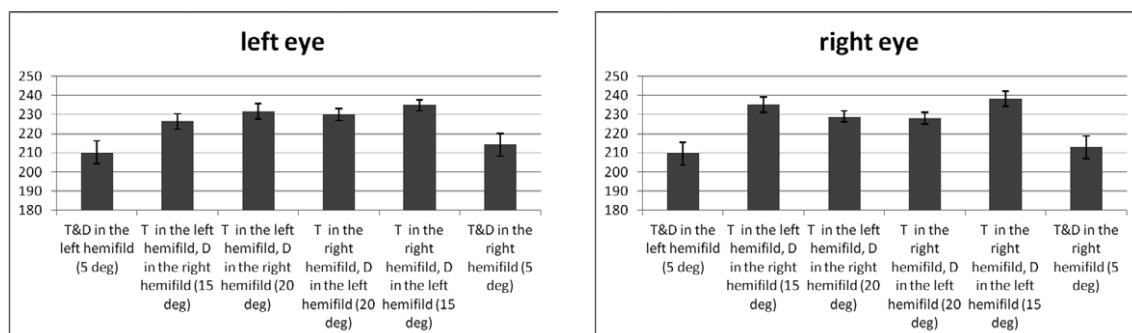


Fig. 2 Mean latent periods (ms) of correct saccades averaged in all subjects (number of stimulation in every spatial position 130–500)

distracting stimuli was presented in different visual hemifields and reduced and reached a minimum when stimuli were shown in one visual hemifield at a distance of 5 degrees from each other ($p < 0.05$) in left and right visual hemifields. The maximum saccadic latency occurred when stimuli were presented in different visual hemifields at a distance of 20 or 15 degrees.

Errors character was dependent from individuality of subjects. Main types of mistakes were: a) incorrect saccade to distracting stimulus and correct one immediately after that, b) correct saccade to the stimulus and corrective saccade after that to the same direction. Some of subjects always had errors of type a), some of them – only of type b), but errors of type a) were more typical for most of subjects in many cases of spatial visual stimulation. Quantity of errors correlated with saccadic latency duration. It was maximal (more than 50%) when stimuli were shown in one visual hemifield at a distance of 5 degrees from each other ($p < 0.05$) and decreased when the distance between target and distracting stimuli was bigger – 15 and 20 degrees. Incorrect saccades of type a) appeared in the case when saccades LP decreased by 50–60 ms in comparison with LP of correct saccades ($p < 0.05$). Often after this wrong saccade on distracting stimulus all subjects made a correction – next saccade on the target stimulus. In some cases and in

some subjects the significant difference between LP of correct and incorrect saccades during stimulation of dominant and subdominant eye was revealed. But these results need more detailed analysis.

Our results are the preliminary first part of a presaccadic ERP study. The main goal of this study is an analysis of presaccadic brain potentials in connection of processes of saccadic eye movement preparation. First results specify that saccadic latency depends on the brain hemisphere where the primary visual information of the stimulus projects. If it's only one hemisphere as in case of presentation of target and distracting stimuli in one visual hemifield at the distance of 5 degrees, LP of correct saccades was shorter but in the same time the quantity of errors was bigger. The leading role of the right hemisphere in a situation of a visual choice is supposed, but we need more detailed analysis of individual saccadic LP distribution of correct and incorrect saccades of different types. Incorrect saccades on distracting stimuli appeared in the case of decreasing of LP at 50–60 ms in comparison with correct saccades. We supposed unsuccessful inhibition of saccade on distracting stimulus in this case. We hope that analysis of presaccadic ERP in LP of correct and incorrect saccades help us to eliminate these assumptions.

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VERBAL WAYS OF TRANSMITTING INFORMATION TO BE USED FOR IDENTIFICATION OF OBJECTS IN REFERENTIAL COMMUNICATION

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Introduction

The aim of the investigation based on a referential communication paradigm was to reveal different ways a person uses to transfer to his partner information needed for identification of complex acoustical or visual targets presented in sets of alternatives. This paradigm was widely used in a number of studies as for example, when investigating reference in a common ground framework and coordination of knowledge in communication (e.g., Fussell and Krauss 1992).

Method

We ran three studies with the similar 2-stage methodology when pairs of participants performed referential communication tasks. First, a speaker had to give information related to the target stimulus in such a way as to make possible for an addressee to identify it in an array of alternatives. At this stage, a feedback was nonexistent: participants were not allowed to communicate until a speaker finished his task. In the case of the right identification of a target, the session was over, while in the case of the wrong identification, communicators were allowed to exchange their points of view in order to ensure the right identification. At the second stage, participants had a possibility to communicate about array of objects and to interact in a free form as long as they needed to make possible an addressee to identify correctly the target. In the *first study*, participants were given a set of 6 identical sounds – the records of the noises produced by closing car doors, which they were able to listen as many times as they liked by pressing correspondent icons on a computer screen as well as to move these icons. In the *second study*, a set of 12 similar color abstract spots which could be also moved on the screen was presented. In the *third study*, referential communication concerned both acoustical and visual stimuli. The speaker described the target drawing in a set of 9 other drawings while the addressee had to identify in

a set of 9 musical fragments the one which they consider to be drawn as an association to the target drawing. Nine musical fragments (guitar, symphonic orchestra, piano, male and female vocals, and two types of synthesized instruments) were chosen from the ones used in our previous study into the preference and comparison of musical fragments (Nosulenko and Starikova 2010). The 9 drawings were chosen from the ones which were produced in the study carried out by Lupenko (2009) where participants were asked to make drawings as associations for the musical fragments. All verbalizations were recorded, then transcribed into the text files and submitted to the original analysis described in details in Samoylenko (2010).

Results

The analysis of verbal texts produced by participants both when their verbal interaction was allowed and forbidden revealed a number of ways of communicating information which were classified according to the following principles. First, the verbal ways were differentiated into those ones which were pure objects' *descriptions* and the ones which contained *verbal comparison*, that is similarities and differences between the objects. Second, the verbal structures were differentiated on the basis of their *object relatedness* either to the target, or to its array, or to both of them. The *descriptions* were applied both to the *target* (TD) and to the *objects of the array*. *Descriptions of the array objects* were divided into the three more specific subtypes used to communicate information about the target: 1) "*Step-by-step constriction of the class*" (SSC) – consequential description of characteristics of the more and more narrow classes the target belongs to; 2) "*Step-by-step elimination*" (SSE) – description of those features of alternative objects that are absent in the target; 3) "*Grouping*" (GD) – the whole set of alternative objects is divided into a certain number of groups with subsequent description of specific features of the group the target belongs to and the target description at the end. As for the *verbal comparison*, it was divided into: (1) the "*target-array classes comparison*" (TCC) – a kind of *comparison of the target object with certain groups of alternative objects* unified by specific common features; (2) the "*paired target-array objects comparison*" (TOC) – identification of similarities and differences between the target and individual objects of the array. The frequency of use of the

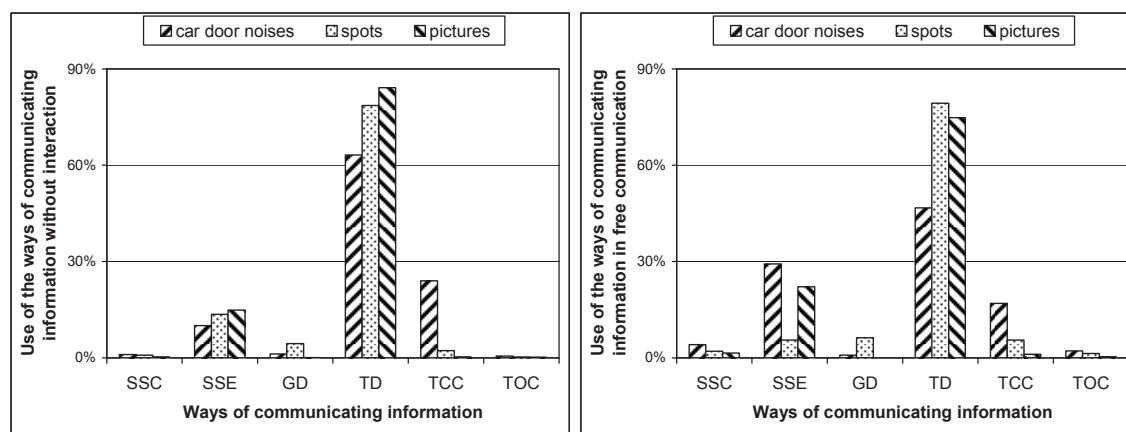


Fig. 1. Proportions of the ways of communicating information in the three studies.

given ways of communicating information is presented on the Fig. 1.

For acoustical and visual objects, the preferred way was to describe the peculiarities of the target itself both at the stage of free communication (Fig. 1 – right) and when it was absent (Fig. 1 – left). Step-by-step elimination was applied both to acoustical and visual objects with its more important presence at the stage of free communication. The peculiarities concern the frequency of use of the target-array classes comparison which was applied more often to the car doors' noises at both stages. As for the other ways of transmitting information, they were used in single cases both at the stage of free communication and when it was absent.

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CONCEPTUAL CHANGE BY ANALOGICAL RECATEGORIZATION

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Analogical reasoning involves transferring knowledge from a well known situation (*base analog*: BA) to a less known situation (*target analog*: TA). Analogies have thus been considered a powerful device to modify representations and concepts (e.g., Hosftadter & FARG, 1995). It has been proposed that the analogical subprocesses by which representational change takes place are mapping and inference generation (Gentner & Kurtz, 2005; Yan, Forbus & Gentner, 2003). While representational change through inference generation has received fair attention, the one that is produced during mapping has

been relatively less studied (Kurtz, 2005). The structure-mapping theory (Gentner, 1989) and the multiconstraint theory (Hummel & Holyoak, 1997) have incorporated a number of re-representational mechanisms that operate during mapping, including minimal ascension, decomposition, and coactivation of semantic units shared by similar concepts. Minervino, Oberholzer and Trench (2008) have argued that a limitation of all available accounts of the role played by semantic similarity on analogical mapping resides in confining its treatment to the level of propositional elements, and argued for the need of broader construals in the treatment of similarity. Oberholzer, Trench & Minervino (2011) proposed an alternative re-representation mechanism that operates on propositions as wholes and not at the level of propositional elements. Such mechanism consists of searching

for a schema relational category (Markman & Stilwell, 2001) for which the compared facts constitute instances. They refer to this mechanism as *re-representation of events*. However, it is possible that in some cases one of the analogs (e.g., the BA) constitutes a typical exemplar of a schema relational category but the other one (the TA) does not, admitting the application of more accessible alternative categories. If the typical BA promotes a relatively improbable categorization of the TA, that categorization could be taken as a case of conceptual change. Consider the following analogs: “Dolores hung garlic on the door” (BA) and “Mary lighted a candle in the basement” (TA). In cases like this, people are likely to categorize the BA as an exemplar of a superstitious behavior (since it is a typical example of that relational category), and then evaluate if the TA could be considered an instance of such category. If the BA represents a typical exemplar of a schema relational category, it may favor the application of such category to the TA in order to reveal the similarity between the base and the target. Oberholzer et al. (2011) refer to this kind of conceptual change as *recategorization of events*.

In previous studies (Oberholzer, Trench & Minervino, 2011) we have shown that an analogy can promote a spontaneous categorization of a non typical TA in terms of the category to which the BA is a typical exemplar. The present study was designed to test whether a TA categorized as a marginal example of a category can be perceived as a more typical example as a result of being paired with a BA consisting of a prototypical exemplar. Let us suppose that a group of people are told that “Peter gave a perfume to Mary”. When asked to rate on a 7-point Likert scale (1= not representative at all, 7= the most typical case) how typical is giving a perfume to a girl as an example of seduction, most would probably grade it quite high. In contrast, let us suppose that a group of people are told that “Peter played a joke on Mary”. Few people would spontaneously describe this as an attempt of seduction. Accordingly, when asked to rate the typicality of playing a joke as an attempt of seduction, they would probably grade it quite low. But how would people rate the typicality of this last case when paired with the former case in the context of an analogy?

Method

Participants. Sixty undergraduate students from the University of Buenos Aires participated in the experiment for course credits.

Materials. We ran a preliminary study in order to select BAs that were considered a typical example of a certain category (e.g., *give a perfume to a girl* as

a typical example of the category *attempt to seduce a girl*). For the TAs we used situations that were not described as a typical case of such pre-established category (e.g., *play a joke on a girl* is not a typical example of *attempting to seduce a girl*). Six critical analogies were used (e.g., *Peter gave a perfume to Mary. John said he had done something analogous when he played a joke on Martha*). There were also six filler analogies. The BA was a marginal case and the TA was a typical case of their category. The aim of the fillers was to prevent participants in the analogy group from discovering the logic of recategorization of the TA in terms of the BA. Apart from this we constructed non analogies: pairs of situations that did not share an analogical relation (the TA paired with an irrelevant situation).

Procedure. Participants read 6 analogies (three critical and three filler) and 6 non analogies and were asked to determine if they considered both situations as analogous. Some participants received the TA in the context of the analogy and others in the no-analogy context. Then they had to rate the typicality of the TA as an instance of the pre-established category. The order of the presentation of the materials was counterbalanced.

Results and Discussion

We compared the ratings of the TAs in the no-analogy context with the ratings of the TAs that were accepted as analogous to the typical BAs in the analogy context. We found a significant difference between these ratings in all comparisons. Participants rated higher (i.e., more typical) the TA as an instance of the pre-established category when it was paired with a BA in the context of an analogy than when it was presented by itself. In sum, the data supports the idea that during mapping a recategorization process is carried out that increases the perception of typicality of a situation as a member of a certain category.

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THE KINAESTHETICS OF MUSIC. MOTION METAPHORS AT WORK IN THE STRUCTURING OF MUSICAL NARRATIVES: A CASE STUDY

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This presentation is based on the assumption that music perception and cognition are embodied, situated activities. Therefore, our notions of musical space (*The soloist is waiting to enter in measure 4*) and musical motion (*Here comes the recapitulation*) are closely dependent on our most basic bodily experience of both physical motion and physical space. Johnson and Larson (2003: 81) have shown evidence that “music is meaningful in specific ways that some language cannot be, but it shares in the general embodiment of meaning that underlies all forms of symbolic expression”. Commensurate with their way of thinking this paper postulates that music is, to the same extent as language, a unique capacity that arguably plays a central role in the origins of human cognition.

The interest in space and motion is also central to Cognitive Linguistics, as evidenced by the work in Cognitive Semantics (Lakoff, 1987; Lakoff & Johnson, 1999; Talmy, 2000) and Cognitive Grammar (e.g. Langacker, 1999). Right at the origin of Cognitive Semantics, Lakoff and Johnson (1980) strongly emphasized the central role of metaphor to embodied thought, its linguistic expression just being a subsidiary matter. Despite the centrality of embodied cognition within Cognitive Linguistics, the study of musical and audial metaphor (which are likewise embodied phenomena) has not received much attention, with the exception of the pioneering work carried out by Zbikowski (2009) and Forceville (2009). Following previous research on embodied music cognition (Johnson and Larson, 2003) and situated cognition (Barsalou, 2009), this article claims that people do not count on a robust way of conceptualizing musical motion and space without metaphor.

In this respect, program music, a type of art music which attempts to render an extra-musical narrative, offers an excellent opportunity to study how the basic PATH, image-schema structures musical narratives. The conceptual metaphors here discussed additionally call up the inherent patterns of VERTICALITY, FORCE and CONTAINER in their respective source domains to conceptualize target domains as the musical rhythm, timing, pitch and phrasing.

Through the analysis of a case study, *Peter and the Wolf* (Prokofiev, 1936), this presentation addresses how these image schemas underlie conceptual metaphors such as those already identified by Johnson and Larson (2003) MUSIC IS A MOVING OBJECT, MUSIC IS A LANDSCAPE and MUSIC IS FORCE, and even others such as MUSIC IS A JOURNEY, MAJOR KEY IS HAPPYNESS and MINOR KEY IS SADNESS. I will additionally address the role of musical metonymy in identifying and characterizing the protagonists of the musical narrative.

The research on which this paper is based has received financial support from grant FPU from the Spanish Ministry of Education. Additionally, this study is associated to Project No. FFI2010-17610, Ministry of Science and Innovation, Spain. This research has been carried out within the Center for Research in the Applications of Language (CRAL), University of La Rioja.

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THE MENTAL REPRESENTATION OF THE WORLD IN PSYCHOSEMANTICS

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All sciences, one way or another, use their own research methods for various sides of what we call the «Reality.» Therefore, there is nothing surprising in the fact that one day their paths would have to cross. Some features of this «intersection» of sciences now seen in the difficulties and challenges transmitting from the field of general scientific methodology to the field of experimental and technological and formal logics (Suprun and others, 2007). These problems are most noticeable in such sciences as Psychology, Physics, Mathematics and Linguistics. One of them is the possibility to give different interpretations to what we are used to call the «objective reality». It appears, for example, in the ambiguity of the values and meanings in Psycholinguistics and Psychosemantics, in a probabilistic description of quantum systems and the reduction of the wave functions, connections of categories of goals and motives with the systems theory, etc. Let's try to bring the paradoxes that arise in these paradigms of these approaches to Reality to a common denominator. Bertrand Russell (1914) believed that as mental sensations are the source of our data, any scientific knowledge in principle is close to Psychological (in any case, what is happening in the world is much closer to a psychological explanation.) It is more convenient to start with the problems issues of Linguistics, as a language as a sign system is a universal tool for general scientific description of the Reality in any science, and its issues touch upon all directions. Linguistics, or more broadly – Semiotics, as the science of signs, has its own axioms and logic («rules of inference»). Any mistake here would inevitably lead to errors in the description of the Reality in any approach, including Mathematics, as the Mathematics is also a language. The famous physicist Werner von Heisenberg, (1989) once

remarked: «... understanding of any kind, whether it is scientific or not, depends on our language, from what we can express our thoughts. Any description of the phenomena, the experiments and their results are also based on language as the only means of understanding. «The fundamental principles of Semiotics are the» conventionalities «and» differentiating meaning «of any sign (Reformatsky, 2002). This means that the sign has no direct meaning, but directes to the meaning. Its semantic content is conditional, so it is a basis of the second signal system (Pavlov, 1951). In addition, the content of a sign is determined by its distinctive capabilities. We can agree on use of some signs to express something in the Reality that are essential for orientation and survival in the general conditions of our existence. The very contrast, conditionally distinguished by our determination of the Reality to»a different thing», determines, ultimately, the content of the sign.

Recognizing the «signal» character of sensations, we must also recognize the model sign character of our understanding of the hypothetical «objective reality» beyond» these sensations. For us, it is important to clearly understand that the «objective reality» is our model of representation of the hypothetical source of «objective» (that is, independent of individual consciousness) component of our sensations. Since the construction of mental representations is carried out on pre conscious level, it is clear that, in the scientific review should be included not only the relationships between objects, but also those algorithms and rules by which these objects are distinguished and built. It is not an easy task because, for example, training the selected objects from the visual field of patients whose cataracts have been removed in adulthood, lasts for several decades. In principle, it is possible in different ways to divide the visible reality in the objects of the same and receive effective for our survival model of that reality. Such differences are noticed by linguists working in the field of comparative studies (Comparative Linguistics). But the overwhelming similarity of the linguistic pattern of the world of different nations makes us to

suspect that there are common principles of such a division for all Homo Sapiens.

Actualization of any interpretation depends on the context of specific situations, the frequency determined by the general conditions of life and environment of these nations. If these conditions differ, then the communication is not adequate (understanding of people each other). As an example, we can recall the behavior of the uneducated flower seller Eliza Doolittle in a high-society environment of Dr. Higgins in George Bernard Shaw's play «Pygmalion.» The multiplicity of interpretations of any concept is well known to linguists (Kobozeva, 2000) and partially represented in monolingual dictionaries. They typically specify the area and the most probable use of specific meanings (eg, in common colloquial language, in the dialect, science, etc.). The attempt to describe the object as a «self-sufficient», irrespective of the conditions of perception, inevitably makes it polysemantic and «virtual» – representing the «superposition» of possible meanings, which is just at the moment of perception, «reduced» to a specific meaning. This corresponds exactly to the phenomenon known in Physics as the reduction of the wave function describing some quantum system (Greenstein, J., Zajonc, A., 2008). Heisenberg wrote about it, thinking about the logical structures in connection with the paradoxes of quantum mechanics (interference phenomena and reduction of the wave function) (1989): «These structures can be obtained, for example, by associations between certain intermediate meanings of words, so, for example, a secondary meaning of the word, almost leaving nothing in memory, can still significantly influence the content of the sentence when the word is uttered.

The fact that any word can cause a lot of half realized motions, which can be used to express through language specific aspects of reality more clearly than would be possible with the help of logics. «The individual creates a mental space in a certain model (or mental pattern of the world) that ordinary consciousness sees as the «objective reality» (see Petrenko, 2010). Here it is necessary to realize that the semantic space of meanings although generates a representation of physical space, but not identical to it. This was mentioned by Bertrand Russell (1914): «Not only colors, sounds, etc. are excluded in the scientific world, but also the space that we perceive when we see and feel». For the science, it is essential that it is a matter in space, but this space cannot be exactly the same space, which we see and feel.» Mental

pattern (or fragments) are transmitted in the form of the second signal system or a language of the individuals. Then the objectivity of these messages (the identity of mental representations) are verified and their conversion into a scientific form of signs (in an ideal display of mental patterns in the form of a mathematical model or theory). Anyway, the sciences make the linguistic modeling of our vision of reality. It is obvious that with the help of signs we can construct a «mental pattern» of what we call the «external environment», but the «pattern» is not the territory or «the object named», according to the famous Alfred Korzybski's principle (see Bateson, 2009). Hence, the object is not a thing «beyond the senses» that existing independently of the knowing subject, and we constructed model of reality («the thing in itself,» according to Kant) checked for adequacy (as relevant empirical model predictions effects) and heuristic (as the prediction of new, previously unknown phenomena) and serving as one of many possible variants of «decomposition» of what we mean by «one reality». Moreover, recent experiments on quantum teleportation (Greenstein, J., Zajonc, A., 2008) suggest exactly the integrity and unity of the Universe, as opposed to his mental «object» of representation. In our opinion, the Psychosemantic approach (Petrenko, 2005, and on Suprun, 2007, Petrenko, Suprun, 2011) allows to detect and adequately describe the mechanisms and rules of a division of the world mentality and build an adequate model of mental representations.

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FORETHOUGHT EXPERIENCE IN ADHD: A STUDY OF THE NEURAL AND BEHAVIORAL CORRELATES

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Abstract

Introduction: Attention-deficit hyperactivity disorder (ADHD) has been associated with subtle neuroanatomical anomalies, as well as deficits in working memory (WM) and behavioral inhibition (Barkley, 1997). Two important components of the WM, hindsight and forethought, have been proposed to be impaired in ADHD, but not adequately studied. Thus, the purpose of the present investigation was to delineate the neural correlates of forethought in ADHD children relative to typically developing (TD) individuals. The existence of a prefrontal dysfunction associated with behavioral inhibition and executive control deficits in ADHD and the link of forethought to WM and inhibition (Barkley, 2011), has lead us to hypothesize that children with ADHD will show atypical patterns of prefrontal activations while performing a task related to forethought.

Methods: Twenty-one TD and 23 ADHD adolescents underwent neurocognitive testing and functional magnetic resonance imaging (fMRI; 3 Tesla) while performing a forethought task. The task consisted of presentations of 56 original cartoon stories; half represented congruent sequence of action and the other half were incongruent. Participants had to answer if “yes” or “no” the sequences of actions make sense according to their expectation. All stories were presented in block of seven stories in a randomized manner. Non parametric statistical tests as well as independent sample *t*-tests and repeated measures ANOVAs were performed to assess differences between groups on correct answers and reaction time on the behavioural data. The fMRI data were analyzed with SPM5. Head movements were added as covariates into the model. One sample *t*-tests were then used to compare incongruent and congruent conditions within each group. Two samples *t*-tests were used for group comparisons.

Results: The behavioral data analysis showed that the mean performances of the ADHD group were consistently below those of the TD group.

Adolescents with ADHD were less accurate on the correct answers for both task's conditions and they made more omissions for the incoherent condition compared to adolescents with TD. Moreover, in all conditions, adolescents with ADHD were slower to respond than adolescents with TD. The fMRI data analysis revealed significant activations during performance of the incongruent relative to congruent condition in the left middle orbito-frontal cortex, the right superior and inferior frontal gyri, right frontal inferior operculum, as well as the left supplementary motor area in the group of adolescents with TD. The opposite contrast did not reveal any significant results. In comparison, in the group of adolescents with ADHD, results showed significant activations during performance of the incongruent versus congruent condition only in the right inferior frontal gyrus (IFG) and the right portion of the basal ganglia (globus pallidus), as well as relative deactivations in the superior frontal cortex for the opposite contrast. The direct

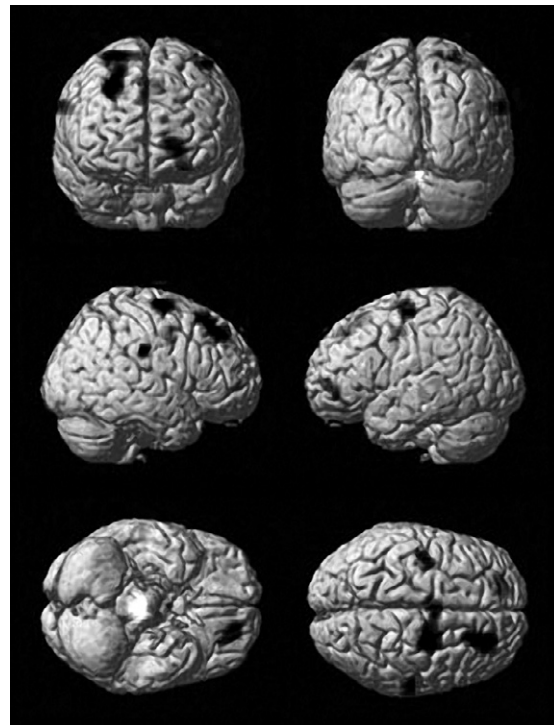


Figure 1: Difference map of results for the TD and the ADHD for the forethought task. Analyses revealed increased brain activations network, predominantly in the frontal regions for the TD relative to ADHD (red). Patients with ADHD showed more localized increased cerebral activation in the cerebellum compared to the TD (green).

comparisons between the diagnostic groups during the incongruent versus congruent contrast, revealed significantly greater activations in the bilateral PFC in the TD adolescents, and more activations in the cerebellar vermis in the adolescents with ADHD (Figure 1 in red and green respectively).

Conclusion: The above results confirm difficulty for adolescents with ADHD to accomplish a task demanding executive functioning such as forethought. The adolescents with ADHD were less accurate and slower than adolescents with TD at forethought. Moreover, these findings are consistent with studies of executive functions and inhibition, which found the involvement of the frontostriatal network in the pathophysiology of ADHD (Bush et al., 2005, Paul et al., 2009). They confirm the role of the PFC in cognitive control and in the ability to orchestrate thought and action and confirm its dysfunction in ADHD. The inverse pattern of activation of the PFC and the cerebellar

vermis in the TD and ADHD group could reflect a compensatory role played by the cerebellum in ADHD or be an indication of the malfunction of the neural network between the two regions in ADHD. Further research of the neural correlates of forethought in ADHD is warranted.

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A CROSS-LINGUISTIC STUDY ON RELATIVE-CLAUSE PROCESSING

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The processing of relative clauses has been an important focus of research on a multitude of languages in various fields of linguistics and psychology over the past two decades because such clauses, with their structural complexity and morpho-syntactical differences among diverse languages, provide rich and unique data for linguistic analyses from typological studies investigating language universals to neuro-linguistic experiments examining memory mechanism in language comprehension.

The present study investigates further the well-documented, controversies notwithstanding, processing asymmetry (Gibson 2000, King and Just 1991, Yang and Perfetti 2010, *inter alia*) between subject and object relative clauses (RC) and uncovers important factors underlying such asymmetry. While most prior RC research focused on studies of sentence or reading comprehension of a particular language, the present analysis is based on data drawn from both discourse production and written texts of Chinese and English. By examining the occurrence and distribution of relative clauses in discourse between the two historically unrelated and morpho-syntactically very different languages, the study aims to explore (1) how cognitive operations conspire with semantic and discourse- pragmatic

factors to generate the often skewed distribution of syntactic types of RCs in discourse, as observed in many languages, and (2) how general cognitive strategies such as easing memory burden and avoiding ambiguity operate with language-specific features to warrant the use of a RC construction that serves a particular discourse function. With this usage-based approach to the study of RCs, we hope to shed light on how language processing should be understood as the direct interaction between cognitive constraints, syntactic structure, and semantic and pragmatic interpretation.

The study first discusses similarities and differences between Chinese and English relative clauses with regard to the basic order of clause, the head NP position, the presence and absence of relative pronoun, and the marking of head NP because although typological differences in the constituent ordering may result in processing differences, languages with structural differences may exploit universal processing mechanisms as well. We argue that clause-level syntactic analysis alone is not sufficient and adequate to explain the observed preference for one type of RC structure over another because RCs are not processed as isolated dependent clauses but used mainly as a grounding and reference-tracking device in discourse (Fox & Thompson 1990, Givón 1993, Pu 2007) and thus have to be studied in the rich context of the entire NP+RC (or RC+NP) construction as it occurs in discourse, i.e., the semantic features

of the head NP, the discourse function of the head NP, the pragmatic status of the head NP, the relative accessibility of the head NP as well as the structural characteristic and discourse function of the RC. Further, in deploying a RC to modify a given NP, speakers are perpetually faced with decisions on when to ground a particular referent and what particular RC to use for the hearer to uniquely identify the referent in discourse processing. This decision-making process is determined largely by the interaction of several factors: speakers' own cognitive demands during discourse production and their assumptions about the hearers' state of knowledge on the referent of the head NP under discussion, the semantic properties of the head NP, and the discourse and situational context in which the entire construction occurs.

The study hence proposes that what determines a language user's choice of a particular relative-clause construction in discourse production depends on general cognitive strategies underlying language processing as well as semantic and discourse-pragmatic properties of the head NP and its relative clause. The cognitive strategies most relevant to RC processing are *Closure* and *Normal Form* (Prideaux and Baker 1986): The former hinges on our working memory (and storage) limitations, and the latter depends on our experience with various structures of utterances, both of which reflect how our mind, with limited resources, processes information recruitment and usage with minimum justifiable effort. The discourse-pragmatic considerations consist of three aspects: information status, topicality and discourse function, the first two of which have to do with the mental accessibility of the head (NP) referent in the mind of the hearer, and the last has to do with the grounding function of a RC. The semantic properties, on the other hand, include humanness, agentivity, and saliency of the head NP as well as its specificity and referentiality. The interaction of these three factors warrants the use and function of relative clauses in discourse.

The study demonstrates that relative-clause distributions between Chinese and English discourse are remarkably similar: While RCs modifying subject head NPs are used almost as frequently as those modifying object NPs, subject RCs (i.e., with relativized subject NPs) are used much more

frequently than object RCs (i.e., with relativized object NPs); while subject RCs modifying subject head NPs are by far the most frequently used RC construction (i.e., the SS structure) in discourse, object RCs modifying subject head NPs (i.e., the SO structure) are extremely rare. Although the asymmetry between subject RCs and object RCs, as found in prior research, do exist in both languages, it is much more complex than a clause-level phenomenon but due largely to the cognitive advantage of subject RC processing and the semantic and discourse-pragmatic properties of the head NP that subject RCs modify. In discourse processing, speakers normally use cognitive strategies such as 'normal order', 'anti-interruption', 'given-preceding-new', etc. to combat the short-term memory constraints. As a result, the relative clauses they produce are usually the types that can be processed with relative processing ease. In addition, the semantic and discourse-pragmatic properties of the head NP of an RC such as topicality, thematic importance, grounding function, humanness, givenness, and saliency conspire to determine the coding of an RC structure, resulting in the given patterns of RC distribution in discourse of the two languages.

Furthermore, the study investigates the similarities and differences of RCs produced between spoken and written discourse in both languages, and explores language-universal as well as language-specific characteristics of RCs in discourse production.

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OUTLINING INDIVIDUAL GRAMMARS: HOW DIFFERENT SPEAKERS EVALUATE RUSSIAN SENTENCES WITH POSSESSIVE PRONOUNS

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Many authors coming from different frameworks agree that modern linguistics should be anthropocentric. Among other things, this presupposes a special interest to the differences in individual grammatical systems. However, there are still very few studies where this problem is addressed. Probably, the main reason is that in the majority of cases, variation in the grammar can be described by opposing the literary norm to a dialect or a vernacular.

In this study, we came across a domain where such dichotomies would not suffice. We conducted several questionnaires where native speakers coming from St. Petersburg were asked to evaluate various Russian sentences with possessive pronouns. The results show a great variety of individual patterns that cannot be reduced to the more or less strict adherence to the literary norm. We identify several factors that might be

responsible for this diversity by playing different roles in different speakers' grammars. In addition to that, we discuss the implications of our findings for the generative theories of anaphora (such as Chomsky 1981; Reuland 2011 etc.), because these theories primarily specialize in explaining why certain sentences are or are not acceptable in a particular interpretation, while other theories aim to answer other questions, e.g. which referential means are used in which contexts, or, when several interpretations of a sentence are possible, which one is preferred in which context (see Kibrik 1996; Mitkov 2002, among many others).

Our questionnaires included 'NP_{NOM} V NP_{ACC}' sentences in different word orders (SVO, OVS, OSV, SOV), 'NP_{DAT} V NP_{NOM}' sentences with the verbs like *nravit'sja* 'to appeal' in the same word orders,¹ and a number of other constructions. Nominative and non-Nominative NPs were used with the possessive pronouns *svoj* 'self's' or *ego* / *ix* 'his / their' in different conditions, and both quantificational and non-quantificational antecedents were tested. Several examples are given below (indices indicate where coreference is intended).

- (1) a. *Otličniki_i ljubjat svoix_i / ix_i učitelej* 'A-students_{NOM} like self's / their teachers_{ACC}'.
 b. *Otličniki_i nravjatsja svoim_i / ix_i učiteljam* 'A-students_{NOM} appeal self's / their teachers_{DAT}'.
 c. *Svoi_i / ix_i učitelja ljubjat otličnikov_i* 'self's / their teachers_{NOM} like A-students_{ACC}'.
 d. *Svoi_i / ix_i učitelja nravjatsja otličnikam_i* 'self's / their teachers_{NOM} appeal A-students_{DAT}'.

Firstly, acceptability of such examples in the intended readings depends on several sentence-internal syntactic and semantic factors. E.g. *svoj* is supposed to be used with Nominative antecedents, i.e. (1a) and (1b) are grammatical with *svoj* and ungrammatical with *ix* according to the literary norm. However, this and other syntactic factors do not play the same role for all speakers: many idiolects significantly differ from the normative Russian. (1b) with *ix* is better than (1a) with *ix* for the majority of speakers, and many of them judge the former as only slightly degraded. We will argue that for some speakers, it is important that in (1b), the Nominative argument is a theme (and is merged internally, according to the generative grammar), while in (1a), it is an experiencer (and is merged externally). To give another example, many speakers rate the sentence *Maše_i nravitsja svoja_i rabota* 'Masha_{DAT} appeals self's work_{NOM}' and *Maše svoja rabota nravitsja* as only slightly degraded or completely acceptable. The norm prescribes to use

ee 'her' in such cases, but many idiolects appear to deviate from it in the cases where *svoj* can be easily replaced by non-pronominal *sobstvennyj* 'own, private'. E.g. *Etu firmu_i rekomendujut svoi_i direktora* 'this firm_{ACC} recommend self's directors_{NOM}', where such replacement is impossible, is universally rejected.

Secondly, the ratings were influenced by several context-related factors, listed in (2a-d). Notably, these factors are almost universally ignored in the formal syntactic tradition, which is obviously a mistake for the 'free word order' languages like Russian. These factors did not play the same role in different speakers' answers, to the extent that certain examples were judged as grammatical by some participants and as completely unacceptable by the others. In our view, this is an expected result: if a

¹ 'NP_{DAT} V NP_{NOM}' is the neutral order in such cases. NP stands for noun phrase.

sentence is degraded in zero context, some speakers would rate it as such, while the others would try to find the right context for it (usually unconsciously), and their ratings would depend on how easily it can be found. To ensure that the relevant phenomena are indeed context-related, we introduced certain manipulations in our examples and in many cases additionally checked whether they improved in various contexts.

(2) a. Canonical word orders tended to receive higher ratings than non-canonical ones, which are normally not felicitous in zero context.

b. Sentences where possessive pronouns preceded their antecedents tended to receive lower ratings. Presumably, in some cases the problem is syntactic (backward pronominalization in Russian is discussed e.g. in (Avrutin & Reuland 2004; Kazanina 2005), while in the others it is context-related: unlike the former, the latter improved in appropriate contexts.

c. Out of sentences with backward anaphora, examples where the pronoun has the same referent as the focused constituent tended to receive especially low ratings. For some speakers, certain sentences improved in context and when the focused constituent was made unambiguously contrastive ('not X, but Y'), presumably because contrastive focus often contains given information in naturally occurring discourse. To give an example, *Ix_i učitelja ljubjat otličnikov_i* 'their teachers_{NOM} like A-students_{ACC}' was judged as degraded by most speakers (3 out of 10, on average). Some of them rated a modified version of this sentence *Ix_i učitelja ljubjat otličnikov_i iz 5A, a ne iz 5B* 'their teachers_{NOM} like A-students_{ACC} from the grade 5A, but not 5B' significantly higher.

d. Verb-final orders, like OSV, presupposing the narrow focus on the verb, tended to receive lower ratings, presumably because the narrow focus on the verb is rare and felicitous contexts are more difficult to conceive of. For some speakers, certain sentences improved in context and when the verb was modified by an adverb, like *očen'* 'very'. E.g. *Otličnikam_i ix_i učitelja nravjatsja* 'A-students_{DAT} their teachers_{NOM} appeal' received lower ratings than *Otličnikam_i ix_i učitelja očen' nravjatsja* 'A-students_{DAT} their teachers_{NOM} appeal a lot' from most participants.

Thirdly, in one of our questionnaires we enrolled participants from different social and age groups (schoolchildren, university students, school teachers, soldiers) and found no correlation between these factors and the tendency to adhere to the literary norm. Apparently, speakers are much less aware of the existence of the prescriptive norm in this domain than in many other cases (like gerund control).

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THE INFLUENCE OF EXPERTISE ON THE BASIC LEVEL EFFECT IN ABSTRACT CATEGORIES

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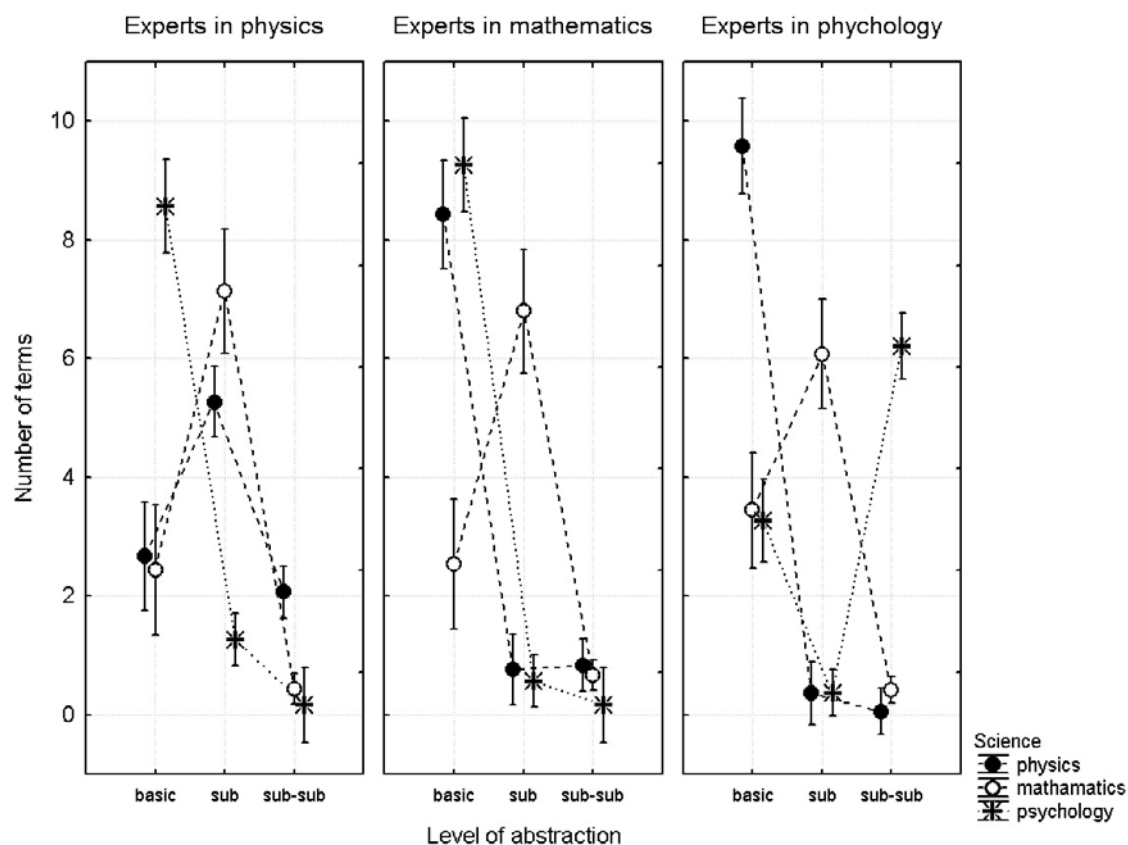
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Psychologists noticed that people tend to name objects at one particular level of abstraction (so called 'basic level'). E. Rosch tried to define basic level through the series of converged operational definitions and connect it with prototype theory (Rosch et al., 1976). The idea of prototype describes the internal structure of category: it is assumed that category members are different in typicality, and more typical members have more common features

with other members of this category and less with the members of contrast categories. Experiments showed that category typicality is an important dimension of semantic memory influencing a wide range of experimental measures and tasks – categorization time, productive frequency, inductive inferences, episodic memory, etc. (Hampton, 1997). The idea of basic level describes similar effect in the hierarchy of categories. One level of abstraction is considered as cognitively privileged with respect to cue validity, gestalt perception, image formation, motor movement, knowledge organization, etc.

Typicality effect is investigated in depth. It could be found not only in natural categories but



Picture 1. Number of terms used to name the science dealing with particular problem for three groups of experts. Vertical bars denote 0,95 confidence intervals.

also in strictly defined and abstract categories, in various fields such as personality perception, categorization of everyday situations, psychotic diagnoses (Hampton, 1997), linguistic categories (Lakoff, 1987). However, the absence of typicality effect in some categories (ad hoc categories, some abstract categories) may be regarded as the evidence that this mechanism is not universal for categorization explanation. That's why it is interesting to check whether basic level effect exists in abstract categories. The category of *science* was chosen as such abstract category because it has wide and well-defined structure. Usually the most frequently used word in object naming task is considered as basic. Similarly it is proposed to consider the task of attributing some problem to the competence of certain field of human activity as operational definition of basic level in the hierarchy of abstract categories.

For the present study three sciences were chosen (*mathematics*, *physics*, and *psychology*). For each science 10 different problems were formulated (e.g., *to find the roots of quadratic equation*). Subjects were to define what field of knowledge solves the particular problem. It was assumed that

for novices (non-experts in any of these domains) categories such as *physics* or *mathematics* would be the basic level terms. Consequently, this level of abstraction will be used more frequently.

It is known that the special psychological status of the basic level can be modified by experience: in the domain of expertise subordinate-level categories become as differentiated as and sometimes even more differentiated than basic-level categories (e.g., Tanaka&Taylor, 1991; Johnson&Mervis, 1997). Consequently, the same effect should be observed in the system of abstract categories. These hypotheses were checked in two experiments.

For the first experiment two groups – novices (first-year psychology students) and experts (last-year psychology students and Ph.D. students) – were chosen for naming task. Statistical analysis shows that expertise influences the level of naming of abstract categories. With the increase in expertise the number of sub-subordinate names is increased and the number of basic level terms is reduced in the domain of expertise. The results also show that there could exist such taxonomic chains where it's impossible to find a basic level category, e.g. *science* – *mathematics* – *algebra*, *geometry* – *linear*

algebra, analytic geometry. Two levels of abstraction (*mathematics* and *algebra, geometry*) were used equally frequently by the participants of the experiment.

For the second experiment three groups of experts (last-year students) in each of the domains were taken. The results presented on the picture show that for two groups of experts basic level shift did occur. For students of physics department former subordinate level became the most frequently used, for students of psychology department even sub-subordinate level became the most frequently used. The patterns of answers of physicists and psychologists in the domain of expertise were very different from the patterns of answers in other domains. Only students of mathematics department showed the same pattern as novices.

The results of the experiments show that abstract concepts could demonstrate basic level effect although there exist hierarchical chains without clear basic level. Expertise in any field of study leads to the shift of basic level effect to more concrete levels of abstraction.

All these facts confirm that we operate with abstract concepts in the same manner as with concrete ones: a certain privileged level of abstraction could exist in concepts' hierarchy and experience in a particular domain may result in cognitive preference of more concrete levels of abstraction.

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PREDICTING THE PREDICTABLE: THE EFFECT OF PROFICIENCY ON LEXICAL-SEMANTIC PROCESSING STRATEGIES IN ADULT L2 LEARNERS

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Since second language (L2) processing has been investigated with event-related potentials (ERPs), there is an ongoing debate whether native speakers and L2 learners have access to the same neural processing capacities and therefore should show comparable ERP responses to linguistic stimuli. With respect to syntactic processing, small changes in the onset of the age of acquisition (AoA) have shown to have a massive impact upon the observed ERP patterns of L2 learners; however, when it comes to semantic processing, even late learners show a qualitatively similar pattern (N400) as native speakers, though onset/peak latencies, amplitude, effect sizes, and distributional parameters of the N400 may slightly differ (e.g. Weber-Fox and Neville 1996; for a review, see Moreno et al. 2008).

Whereas most discussions about lexical-semantic N400 effects are based on the “N400 congruity effect” (difference wave between congruous and incongruous words) or proceed from the unquestioned assumption that “larger N400s”

for incongruent relative to congruent words always reflects increased processing costs for the former, only few studies considered the possibility that the N400 might not be a monolithic effect, but – at least under certain conditions – could involve *qualitatively* different processes (e.g. Vespignani et al., 2010; for an extensive discussion of this issue see Molinaro and Carreiras, 2010).

For example, Roehm et al. (2007) found evidence for distinct parsing strategies due to task demands and/or semantically restrictive contexts. In a sentential context involving antinomies (e.g. The opposite of *black* is ...) participants showed a P300 for the sentence-final word in the antonym condition (*white*), in contrast to graded N400s for the related (*yellow*) and non-related (*nice*) conditions. The authors suggested that the P300 reflects the match between the parsers' prediction of an incoming element (pre-activated representation) and the target stimulus.

In this experiment we wanted to investigate whether a prediction-based processing strategy is observable in high cloze-probability sentences for native speakers of English and whether such a strategy is restricted to L1 speakers or is also accessible to speakers with English as L2.

13 native English speakers and 13 advanced German learners of L2-English read sentences where the sentence-final word either was semantically congruent (A) or incongruent (B) with the previous context. Crucially, the prior context enabled a strong prediction about the upcoming last word. The stimulus material was part of a larger study with various conditions (reported elsewhere). The two groups showed no differences with respect to behavioral measures (accuracy, RT).

As in previous studies (see Moreno et al., 2008), semantically deviant structures elicited

a similar N400 for both groups (L1 & L2) suggesting similar processes for native and L2 speakers. More interestingly, only the native speakers showed an early positivity (P300) for semantically congruent sentences, thereby indicating a prediction-based parsing strategy. As the P300 was absent in the L2 group, we conclude that language learners – even with an advanced proficiency level – do not have access to the same neural resources that enable a prediction-based processing strategy in native speakers.

Stimulus examples:

A. **semantically congruent:** *The tree was too high to climb.*

B. **semantically incongruent:** *The tree was too high to laugh.*

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THEORY OF MIND AND NEUROCOGNITIVE FUNCTIONING IN PATIENTS WITH SCHIZOPHRENIA AND HEALTHY CONTROL

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Introduction Reduction of social cognition is consistently registered in schizophrenia spectrum disorders [review Penn D.L. et al., 2008]. In particular, a number of researchers have shown an impairment of social cognition in form of theory of mind (ToM) in patients with schizophrenia. ToM refers to the ability to represent human mental states. It includes the understanding of false beliefs, hints, intentions, deception, metaphor, irony and faux pas. The etiology of ToM deficits in schizophrenia remains unclear, in part because the genesis of normal ToM is still unknown [review Penn D.L. et al., 2008]. Many researchers have noted the relationship between ToM and the frontal lobe, mainly of the right hemisphere [review Brune M.,

2006]. In this work we studied ToM in patients with schizophrenia spectrum disorders. Also, we analyzed the relationship of ToM with some processes of selective attention and some structural-functional characteristics of the dorsolateral prefrontal cortex (DLPC). The former was done with the additional analysis of the auditory evoked related potentials (ERP) in the oddball paradigm as P300 wave of ERP is considered to reflect the processes of working memory maintenance [Polich J., 1999]. The latter comprised the study of the proton magnetic resonance spectroscopy data in DLPC. The analysis was done for N-acetylaspartate (NAA) which is assumed to be a marker of the neuronal tissue functionality [review Dager S.R. et al., 2009]. It was hypothesized that ToM would be compromised in schizophrenia and correlated with the lower and more prolonged P300 and lower NAA.

Methods The sample comprised 20 young (21.9±2.3 years) right-handed male patients with schizophrenia or schizoaffective disorder (F20, F25, ICD-10). The patients were in the clinically stable state, PANSS positive scores were 10.5±2.7; negative scores – 17.2±4.7; global

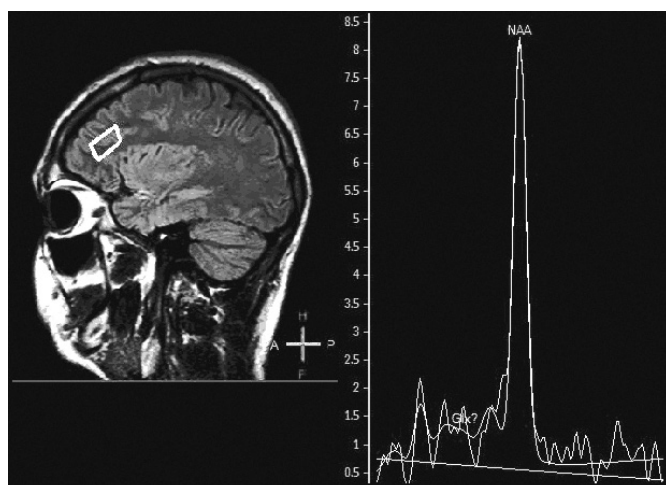


Fig.1. Anatomical localization of voxel and part of the obtained spectrum with NAA peak in one of the control subjects.

scores – 56.6 ± 11.4 . The control group comprised 15 age-matched (22.4 ± 2.06 years) mentally healthy right-handed males. 6 patients and 7 controls underwent also 1-HMRS analysis.

ToM was studied with the second order false belief (FB) and faux pas (FP) tasks. FB tasks tested the ability to understand what someone else thought about what another person thinks. FP tasks were directed to the ability to define awkward situations in communication between people. The false belief test was as followings: Martha and Oliver are sitting in the kitchen talking. Oliver is eating cookies. Oliver gets up and leaves the room. Martha closes up the box of cookies and puts them away in a cabinet. While he is outside of the room, Oliver looks back through the keyhole and sees Martha moving the cookies. Martha goes back and sits down. Then Oliver opens the door. The faux pas test was as followings: Helen's husband was throwing a surprise party for her birthday. He invited Sarah, a friend of Helen's, and said, "Don't tell anyone, especially Helen." The day before the party, Helen was over at Sarah's, and Sarah spilled some coffee on a new dress that was hanging over her chair. "Oh!" said Sarah, "I was going to wear this to your party!" "What party?" said Helen. "Come on," said Sarah, "Let's go see if we can get the stain out." [Stone V.E. et al., 1998; Russian adaptation – M. V. Alfimova et al., 2003]. The subjects were read the test stories and asked the questions about them.

^1H -MR spectra were acquired on a 3T Phillips Achieva (Holland) scanner using presaturation pulse and PRESS with TE = 35 ms, TR = 2000 ms. The voxel ($20 \times 15 \times 10 \text{ mm}^3$) was placed in DLPC (Fig.1). The ratio of NAA/H₂O was analyzed.

Stimuli presentation in the standard two-tones oddball paradigm and ERP recording were done with NeuroKM mapping system (Statokin, Russia) coupled with the audio generator (MBN, Russia). Targets were tones (1000 Hz, 60 dB) presented with

the probability of 0.8, non-targets – tones (2000 Hz, 60 dB) with probability of 0.2. ERPs were sampled for 30 targets, P300 peak amplitudes and latencies were analyzed.

Results There were no significant differences between groups in ToM tasks (1.9 ± 1.3 vs 1.5 ± 1.2 for false belief tasks; 2.9 ± 0.4 vs 2.8 ± 0.4 for faux pas tasks) and between groups in NAA (0.86 ± 0.08 vs 0.8 ± 0.13 in the left hemisphere; 0.88 ± 0.09 vs 0.8 ± 0.06 in the right hemisphere). There were found significant differences ($p < 0.05$) between groups by P300 latency in F4, F8, P4, and amplitude in F8. There were found significant correlations ($p < 0.05$) between faux pas tasks results and NAA in the left hemisphere ($r(\text{Sp}) = -0.8$), as well as between NAA in the right hemisphere and P300 latency in T3 (-0.9) in the control group.

Discussion Although preliminary, the findings did not support the hypothesis. ToM in schizophrenia patients did not differ from norm. It contradicts the findings of the other authors [Alfimova M.V. et al., 2003 for example] probably due to the medicated and clinically stable state of the patients with marked reduction of psychopathological symptoms. In addition, the relatively young age of the subjects assumes the higher brain plasticity and more pronounced compensatory resources. Both factors could be accounted for the relative "normalization" of some mental processes.

In this context, the found intergroup differences in P300 could be due to the abnormalities of the wave's generators located out of the DLPC (probably in the temporal zones).

The found relationships between ToM faux pas and NAA in norm emphasizes the impact of DLPC to the support of some higher mental processes in man.

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COMPARISON OF VISUAL OBJECTS IN DIFFERENT CONTEXTS OF THEIR PRESENTATION

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The problem

The problem of the context as related to cognitive processes has been systematically considered since the pioneering works of Gestalt psychologists who were the first to show, for example, the perceptual contrast phenomenon. The influence of context on comparison of objects manifests itself in the presence of the Ebbinghaus illusion investigated in experimental studies (e.g., Hassin, 2001). It was also revealed that linguistic context influences subjective ratings of words' similarity (e.g., Medin, Goldstone, Gentner, 1993). A further investigation of the given problem was carried out in the current study.

Method

The aim of the study was to examine how comparison of two similar visual objects is affected by the type of the context they are perceived in. Two aspects of comparison were investigated: subjective evaluation of similarity of two objects and verbal description of their similarities and differences. Experimental study with the independent measures design consisted of the 3 main series: the target pair of objects was presented in the context of either similar or different to them objects, or without any surrounding at all. Participants performed two tasks: they made evaluations of target objects' similarity using a 10-point scale and produced subsequent explanations of the reasons of giving a certain similarity value. Verbal statements were tape recorded, transcribed into the text files, and treated with the special method of analysis (Samoylenko, McAdams, Nosulenko, 1996).

Two photos of very similar female eyes served as the target stimulus pair. For the context of similar objects ("homogeneous context"), 7 photos of female right eyes, close to the target pair in color, general contours, and ethnical reference were used (Fig.1-left). The context of different objects ("heterogeneous context") included 7 photos of eyes, differing in color, shape, size, and ethnical reference (Fig.1-right).

Results

The results concerned the target objects' subjective evaluation of similarity (Fig.2) and their verbal comparison in different experimental situations (Fig.3). One and the same target pair

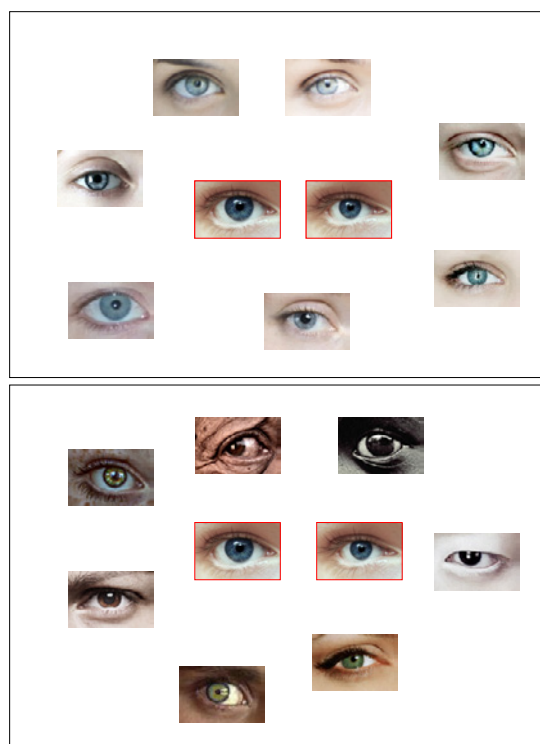


Fig. 1. Stimulus material.

of objects was subjectively rated as significantly less similar ($P \leq 0,001$) when it was presented in a "homogeneous" context than in the "heterogeneous context".

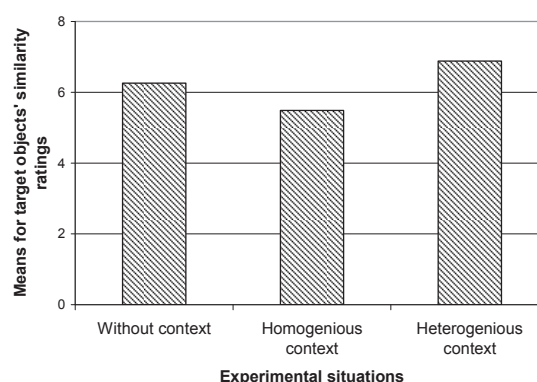


Fig. 2. Similarity ratings of the target objects presented in and without contexts.

When the target pair of objects was presented without the context, there was a tendency to verbalize more of their differences than similarities. When the same pair of target objects was presented in the «heterogeneous» context significantly more

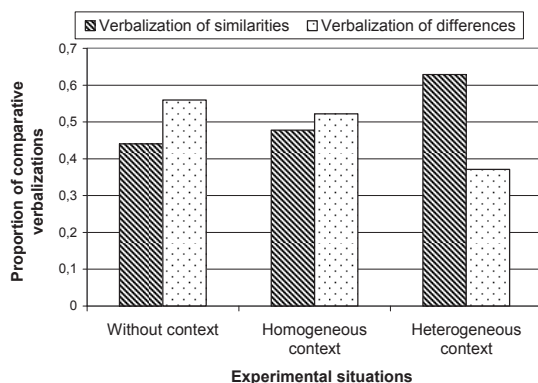


Fig. 3. Verbal comparison of target objects presented in and without contexts.

of their similarities than differences were verbalized (at $P \leq 0,001$). In the «homogeneous» context, the

proportions of verbalizations containing similarities and differences between the target objects were found to be approximately equal.

Thus, it was experimentally demonstrated that subjective evaluation of objects' similarity is a context-specific process. The study also showed how verbal comparison of objects is influenced by the type of surrounding context they are presented in.

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COGNITIVE CORRELATES OF INDIVIDUAL DIFFERENCES IN DECEPTION

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The main goal of the project is to identify the neurobiological correlates of individual differences in ability to deceive others. The definition of deception is narrowed to presenting false information about personal characteristics in order to make others like the deceiving person. For experimental purposes, a new paradigm based on 'speed-dating' social event was prepared, in which the subject will take part in a series of short talks with potential dates. The subject will be instructed to make all the dates like him or her.

The initial chatting partner will present the subject with some sparse information about him- or herself and then start asking questions related to the subject's personal attitudes. Bearing in mind the instruction, the subject will have to adjust and give the answers which he or she will perceive as most likely to be shared by the date. This is based on a widely recognized presumption that people who have more in common get to like each other more easily. The series of chats will then continue with subsequent dates who will reveal different personal information to the subject.

During the experiment each of the questions regarding the subject's personal attitudes will be

asked by at least two different dates – preferably by those who have presented extremely polarized personal information. This part of the experimental paradigm is absolutely crucial – having to answer same questions from different dates, the subject will be forced to give opposite answers in order to make both dates like him. The paradigm avoids the main fallacy of deception studies as the subjects will be free to make their own decisions when to lie or when to tell the truth. The influence of the specific cognitive processes on the ability to lie will be investigated, thus providing more precise characteristics of the cognitive processes underlying deception.

Cognitive abilities which, according to the model presented by Walczyk (2003), may have a significant effect on the process of lying, include: the efficiency of the working memory, attentional set-shifting and cognitive control with special emphasis on inhibition of the automatic information. The level of those abilities in subjects will be respectively measured by the following set of tasks:

In the working memory (WM) task, three geometrical figures are displayed to the subject serially in random order. The subject's task is to count the number of appearances of each figure and press a button when the same figure appears for the third time. This task requires constant updating of the working memory (counting the number of 3 figures and resetting the counter after successful answer). The task is difficult, but suitable

for capturing subtle differences between young and healthy subjects. The total number of correct responses will be used as a primary measure of WM performance (Chuderski and Chuderska, 2009).

In the task measuring the effectiveness of attentional switching, the subjects are presented serially with digits from range 1–4 and 6–9. Before each number an instruction is presented. If the instruction says ‘smaller’ the subject has to press the left button if the number is smaller than 5 and the right button otherwise. When the instruction says ‘even’, the subject has to press left button if the number is even and the right button otherwise. The instructions and stimuli are presented rapidly (1s for instruction and 3s for the decision). The instruction changes each 3–6 trials. The primary measures of attentional switching is the general accuracy (number of correctly classified numbers) and the difference between RTs immediately

after the instruction switch and between switches (Chuderski, 2007).

Inhibition will be measured with a similar task. The subjects will be presented with digits from range 1–9 and their task will be to press the left response button when the number is even and the right button otherwise. However, in random 50% of the trials the digit will appear inside a square. The subjects will have to give an opposite response (even – right button, odd – left button). The performance will be measured in terms of correct trials and the difference in RTs between the inhibition and no-inhibition condition.

To conclude: we would like to check if subjects with the higher level of working memory, inhibition and attentional set-shifting will present shorter reaction times while lying which will enhance the accuracy of their lies in comparison with the subjects with low degree of these features.

THE REENACTMENT OF KNOWLEDGE: SENSORY-MOTOR REPRESENTATIONS IN MENTAL LEXICON

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The avalanche of works in neuroscience shows that virtually the whole brain is involved in mental performance [Chernigovskaya et al. 2005]. Functional imaging provided strong evidence for the sensory-motor theory of semantics [Noppeney 2009]. This theory suggests that semantic processing relies on reactivation of sensory-motor representations that were involved in perception and action. There is an increasing interest in the effects of sensory-motor knowledge on referential semantics.

Two traditional views, embodied and symbolic, have crystallized over the years to advocate for the long-standing debate on interaction between linguistic and sensory-motor processes and the nature of cognitive representations (see [Barsalou 1999; Barsalou et al. 2003; Decety and Grezes 2006; Glenberg and Robertson 2000; Gibbs 2006; Kaschak et al. 2005; Zwaan 2004] vs. [Pylyshyn 1984; Chatterjee 2010]). There also appear new hypotheses that attempt to couple these two approaches showing the neural overlap between action, imagination, and language, and providing evidence that the existence of a level of abstraction above multimodal representations is not necessarily

at odds with the idea of embodied cognition [Taylor & Zwan 2009].

These findings resonate with our view of mental lexicon as a dynamic functional system. The items in the mental lexicon are viewed as products of a complex interaction of perceptual, cognitive, emotional, and verbal experience stored in one's memory and simultaneously utilized at different levels of consciousness when a word provides access to interconnected fragments of the personal knowledge in our mind.

The focus of this paper is to explore the links that connect language, perception, and action that are at the core of embodied theories. Language constitutes a set of cues for forming mental representations of the referential situation, a situation model by guiding attention to aspects of the referential world. A central question in psycholinguistic and cognitive science research concerns how semantic information can refer to things in the world.

Here, we will briefly review evidence coming from previous decades of research on the interaction between language, objects, and actions, in addition to exploring the empirical results of recent experiments and methodologies. Our earlier research in the strategies of object and action naming revealed that actions are very often identified via tools (objects), whereas objects' identification and naming is often mediated by actions.

Barsalou's [1999] perceptual symbol systems theory provides a theoretical framework for how

lexical semantics can be grounded in sensory-motor processing. Since conceptual knowledge of objects is gained from bodily-environmental (inter) actions via many modalities, motor and kinesthetic modalities (e.g. grasping and manipulation objects) capture important features of objects, which are incorporated into the lexical-semantic system. Retrieval of sensory-motor knowledge involves partial neural reenactment of sensorimotor states that were active during various encoding episodes, and can be measured by body-object interaction index [Wellsby 2011]. At conceptual level it corresponds to mental simulations, often described as mental models of situation.

Two questions arise from these speculations: How a person will identify and name a new object with no prior sensory-motor experience, and how a person will identify and name an action if only motor information is available for identification? Since both, object and action concept activation is related to accessing conceptual information about action attributes, it seems plausible to assume that sensory-motor knowledge is involved in identification, categorization and naming of actions and objects, interacting with other available conceptual and contextual information. To further explore embodied effect on referential semantics we have examined the influence of motor experience on lexical conceptual processing of objects and actions.

Experiment 1. The data collected in the object-naming experiment for 45 colored pictures (collected by Jessica Horst) were analyzed to explore what cues are more typical and what features are more recognizable in spontaneous object naming. The participating subjects were all native speakers of Russian and had normal or corrected-to-normal vision. All participation was voluntary. Pictures of novel objects were used to elicit names, each picture is of a real 3D object, though none of the objects have names. Depending on the perceptual and/or semantic cues competing to trigger a word for naming, the naming strategies were brought to light. We show that different motor affordances may vary in their richness, and may represent a different part of conceptual knowledge during semantic processing.

Experiment 2. In order to observe motor effect on action identification we used a set of moving stimuli involving human actions under point-light conditions as seen from different viewpoints. 22 fairly short, well-delineated, and visually “loopable” actions include the dynamic component and, thus, can be viewed as context-free and situationally independent visual representations of actions. 20 subjects with no prior experience with point-light figures participated in action naming experiment. We have collected some preliminary data regarding spontaneous naming of these actions.

Our findings strongly support the prediction we provided above, namely, sensory-motor information is an integral component of lexical semantics for both, objects and actions. The degree of sensory-motor involvement appears to depend on the depth of semantic processing.

Potentially important co-findings are also discussed in terms of future research.

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DIAGNOSTIC SIGNIFICANCE OF SLEEP IN DISORDERS OF CONSCIOUSNESS

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Introduction: It is well known that abnormalities of sleep are extremely common in patients suffering from clinical disorders of consciousness. These patients exhibit more arousals and awakenings than healthy individuals and alterations in rapid eye movement (REM) and slow wave sleep (SWS) are common. Previous studies report that the reappearance of organized sleep elements, like stage 2 sleep spindles or K-complexes have predictive value for “good outcome”. A better characterization of sleep timing and sleep architecture in this group of patients might therefore be of foremost ethical relevance. However, it appears that the very existence of sleep is a challenging issue as these patients do not show the normal behavioural, physiological and regulatory signs of sleep.

Method: Up to now we performed 24h polysomnographies in 34 patients being either in a vegetative (VS, i.e., unresponsive wakefulness) or minimally conscious state (MCS, i.e., inconsistent but discernible evidence of awareness) following brain injury. Coma state was classified using the Coma Recovery Scale-Revised (CRS-R).

Results: First analysis indicates that VS and MCS patients differ especially in REM sleep, sleep spindles and cortical desynchronization arousals. More complex sleep architecture (presence of SWS and/or REM) appears to be present in MCS as compared to VS patients ($\chi^2=5.87$, $p=.053$). Furthermore, CRS-R is positively correlated with sleep onset latency ($r_{16}=.58$, $p<.001$), and spindle intensity at central and frontal recordings sites (e.g. C4, $r_{32}=.34$, $p<.05$). Finally the arousal index indicates to be higher in MCS than VS patients ($t_{14}=-1.86$; $p=.084$), presumably reflecting a more dynamic brain state in MCS than VS.

Conclusion: 24hr polysomnography appears to allow the identification of EEG markers which can help in assisting the inherently difficult diagnostic process as well as prospective prognostic statements for “Disorders of Consciousness” patients.

EYE-MOVEMENTS REFLECT INFORMATION SEARCH IN MEMORY DURING DIAGNOSTIC REASONING

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Diagnostic reasoning aims at describing cognitive processes to find a best explanation for a given set of observed symptoms (Josephson and Josephson 1996). Till now, it was hardly possible to trace information search when observations are retrieved from memory. The presented experiment used eye-tracking as a process-measure to study diagnostic reasoning. The method is based on the observation that people fixate on blank locations if

a relevant visual stimulus previously occupied that spatial location. Participants first learned the causal structure underlying possible hypothesis with each hypothesis being presented in a different spatial area. During hypothesis testing, the display was empty. Participants showed more fixations towards spatial areas that were associated with currently valid hypothesis both when new observations were presented as well as when giving the diagnosis. More transitions were made between valid in comparison to invalid areas. Therefore, eye-movements can provide an online-measurement tool of foregoing cognitive processes in diagnostic reasoning.

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THE DARK SIDE OF THE RAINBOW – CHANGING CONCEPTS OF TEACHING AND LEARNING AMONG TEACHING-TRAINING STUDENTS

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Dark Side of the Rainbow (also known as Dark Side of Oz or The Wizard of Floyd) refers to the pairing of the Pink Floyd music album 'The Dark Side of the Moon' with the visual portion of the classic film 'The Wizard of Oz'. This produces moments where the film and the album appear to correspond with each other. (<http://video.google.com/videoplay?docid=-76123313707631450>).

Can such synchronicities be done with teaching and learning concepts?

The study investigated the impact of first-year teacher-training college curriculum on the students' perceptions of teaching and learning, with a follow up during their studies. The essence of the program is self-study in peer groups mentored and supervised by senior college staff. Learning is organized around questions, with the aim being not to find the one correct answer but to raise and explore fertile questions which are not clear-cut but evoke doubt and where many and even contradictory answers are possible. In other words the program design is oriented on process not solutions. It compels trainee teachers to intellectually and methodologically confront the problems set by the content of education's core disciplines, these disciplines being taught as general introductory first-year courses, in an interdisciplinary framework.

Data was gathered by means of a structured statement questionnaire devised for this evaluation and completed by students at the start and end of the program, and during the following three years. Statistically significant differences were found between the measurements on all indicators relating to perceptions of teaching-learning. After the program fewer students held to the traditional conception of teaching (as 'delivery') and more to the notion of learning as self-created knowledge. Most of these measurements were stable during the three years of follow up.

A preliminary program was presented at the 4th International Conference on Cognitive Science (Tomsk, 2010). The present paper demonstrates the changes of a unique innovative leaning model for teacher-training. Its essence is **self-study in peer groups mentored and supervised by senior teachers**. It compels trainee teachers to intellectually and methodologically confront problems set by education's core disciplines, taught

as general interdisciplinary introductory first-year courses.

One of the program's fundamental premises is that in their working life teachers will tend to reproduce the style of learning and thinking experienced when training. Thus, significant long-term changes in patterns of learning and thinking do not result merely from structural alterations: as an extra course in approaches to thinking or a training course geared at changing teaching methods.. This new program does not teach thinking but **follows the principle that 'the medium is the message'**.

Rationale:

The main purpose of the program was synchronizing the new concepts of teaching and learning, which are unsuitably embedded in teacher-trainees' minds. Learning in the program is organized around questions, fertile questions deliberately directed at situations which are unclear, ambiguous, open to doubt and where many and even contradictory answers are possible. This approach, which flouts the conventional model of questions designed to have only one correct unambiguous answer, forces trainees into an intellectual and emotional confrontation with issues which is by no means easy but which is immanent to the program's world view.

Methods

The sample comprised 117 first-year teacher training students from all study tracks. Data were gathered by means of a structured questionnaire constructed specially for this evaluation. The questionnaire comprised statements about the five elements of a teaching-learning process: the good teacher, the good student, good learning, a good question, and good college teaching. The questionnaires were completed at the start and end of the program.

For the duration of the program the students were allocated to plenary/main groups of roughly 25 students each. Each main group was then split into smaller working groups of 4–5 students, taking care to include students from all study tracks. At the start of the program the main groups met twice with their group leader, who set out for them the program's structure and rationale. After this the group leaders were available to assist the working groups as needed.

The last meeting was reserved for the working groups' presentations to the main group. The presentations could take any of a variety of forms and techniques except that of a written work comprising mainly the written word. These

presentations compelled the students to isolate the distilled essence of each question, set out the different possible responses, the issues and controversies inherent in each, and identify those questions which had to remain open.

Results

Factor analysis of the independent variables with respect to each of the five elements studied isolated two factors corresponding to the theoretical hypothesis: one corresponded to the traditional conception of teaching-learning (the 'delivery' method), while the other corresponded to the conception of students creating new knowledge for themselves on the basis of known knowledge. T-tests of the differences in ten indicators were used to compare the two conceptions 'before and after' the program. Statistically significant differences were found on all ten indicators between the two measurement times which, summed together, showed the traditional conception to have declined and the self-created knowledge conception to have strengthened.

'Before' the program the good teacher was perceived as a well-organized lecturer, but 'after' as someone who challenges the students' modes of thinking. The good student went from being

an attentive listener and summator to being a questioner. A good question went from being one having a clear answer set out in the course material taught to being one that resonated and evoked doubt.

The reflective findings reported reinforced the above findings: students reported that the program had markedly influenced their thinking, emphasizing the legitimacy of the differences between them as students:

The research results demonstrate that not only did the program achieve basic change in the trainees' perceptions and understanding of basic concepts in teaching and learning, it also made them reflect on their ideas of what education is and gave them the legitimacy to continue reflecting on such topics over the remaining years of their studies, continue probing into them and not stop submitting them to review. Having the students investigate educational issues in the framework of **different forms of research community is to model** for them a particular approach to education: these communities provided fertile ground for trying out teaching and learning methods that they can apply as new young teachers. Most of these cognitive changes were stable during the three years of follow up.

INTEGRATING THE CONCEPT OF STRENGTHS: WHY ISN'T STRENGTHS ACKNOWLEDGEMENT SUFFICIENT IN HELPING STUDENT-TEACHERS BECOME BETTER TEACHERS?

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Background: Strengths is a novel approach, based on positive psychology, developed as a result of an extensive study performed by Buckingham & Clifton (2001). The coaching via strengths approach contradicts the popular approach that assumes that one has to focus efforts to his/hers weakness area in order to improve, and not in which one is talented in. This was stressed in teacher education by Liesveld, Miller, and Robison (2005).

Based on a former study (Segal et al., 2011) it seems that one of the goals of teaching colleges is to raise the awareness to the language of trainee's strength. Contrary to Peterson and Seligman (2004) the study showed that identifying personal talents and strengths is insufficient for the teaching trainees to be able to fulfill themselves. In addition to identifying the talents and strengths it is necessary to know them by **efficient knowledge**. An effective acquaintance with strengths is important for building

professional identity, and may increase motivation and belief in personal and professional capability, and by that increase the sense of happiness and welfare of teaching trainees and future teachers.

The purpose of this study: to further examine the subjective concept of strengths among teacher-students and to provide data regarding **efficient knowledge of the concept of personal strength**.

Tools: 110 students were given a half structured questionnaire consisting of open ended questions studying self perception of strengths and weaknesses and perception of the path to becoming a better teacher. There were two versions:

1. Three questions checking: strengths of the future teacher, their weaknesses, and the path to becoming a better teacher
2. Same as above version without the question concerning their weaknesses.

Results: Content analysis of the responders' answers shows that the teacher-students are aware of their strengths. Nonetheless, the answers regarding the weaknesses as well as regarding the desired improvement to become better teachers shows that

knowing the strengths and weaknesses is not enough. One of the interesting findings shows that in some of the cases the same quality was reported by the same responders both as a **strength and a weakness**. For example: “I am very sensitive” as a strength, next to “I am too sensitive” as a weakness. Meaning, even when strengths are acknowledged, it can be inefficient and serve as a “two-edged sword”. That is to say, the same characteristic/quality is one’s strength as well as weakness. In other words, the same characteristic that will make me a good teacher will also make me a bad teacher. It is possible that this ambivalent perception regarding a strength may confuse, damage the efficiency of the strength and **taint** it.

The desire to lessen the quality, may indicate a confusion created by the ambivalent perception regarding the quality.

Reciprocal relations between exposure to personal strengths and optimistically, operational and target-oriented conversation were found. When the context is **strengths** only, an improved motivation was found, expressed by forming effective self improvement strategies while using active verbs and emphasizing the aspiration to gain additional professional knowledge. It was found that when the context is **weaknesses**, a significant change accrued in the discussion regarding the desired improvement. In these cases, the tone becomes more passive (reality works on me, not I work on reality), less belief in my ability as an individual to change is seen, and there is a frequent use of passive verbs (“**I will be** less sensitive”, “**I will become** more assertive”). In these cases the usage of a semantic field based on “reduction” was eminent, meaning improvement via reduction of a negative quality as opposed to addition of a positive quality.

One of the interesting innovations of this research was the discovery that weaknesses

reported in high frequency are in the emotional and interpersonal field. However, despite the discussion about strengths, the discussion here is about “overdose” of the characteristic. Meaning, if the answers regarding strengths statements such as: “I am sensitive”, “I have a sensitivity”, “I am good and maternal” appeared in the answers regarding weaknesses, the same characteristics appeared together with the words “Too much”. In most cases the responders explained that the overdose of these characteristics decreases their assertiveness and their ability to effectively set boundaries.

Therefore, it seems that **recognizing the strengths is not enough**, but one has to **effectively** understand the concept, and inspire to make the concept **clear**. The question is not only the existence or lack of a certain strength, but, more important, interpretation of the concept of the strength. In this case, of ambivalence regarding the strength there is a need in creating integration within the strength. Meaning, replacing the ambivalent conceptualization (good or bad, harmful or efficient) within integrative-complex conceptualization that sees the positive aspects of the strengths next to the less positive aspects.

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COGNITIVE LINGUISTIC BASIS FOR AN EXPERIMENTAL STUDY OF RUSSIAN AND SWEDISH VALUES

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The joint research project that was realized by an interdisciplinary group of Russian and Swedish linguists, psychologists, sociologists and educators (the Swedish Institute grant), besides pragmatic sociological goals of finding

out relative qualitative-quantitative features of national cognitive value representations, had also some methodological goals. They were to check the efficiency of the experimental techniques and, hence, their theoretical basis.

The methodology of the study is based on the following theoretical postulates. Since language and knowledge (first of all, background knowledge are the phenomena that exist in a distributed form among the members of a certain community, a special

psycholinguistic experiment with a representative group of respondents can be considered as a basis for reconstructing a social cognitive representation.

The meaning of a linguistic unit may be viewed as verbalized knowledge, i.e. the knowledge that obtained its own verbal form of expression and, thus, there is an opportunity for exteriorization (external communicative representation), discreteness, combinatorial mobility, etc. As to the concept, this is also knowledge, but the knowledge considered from the point of view of its being constantly included into the integral distributed cognitive system. In this system it has its own cognitive function.

The knowledge structure is formed in the ontogenesis with the participation of language signifiers. However, the sum of linguistic meaning is not equal to the sum of knowledge: besides meanings (verbalized concepts), people accumulate and systematize huge volumes of episodic perceptive experience as well as of generalized structures, such as events, motivational and causative-consecutive links between events, possible events (like human actions) and their evaluation from the point of view of values, norms, etc.—all that is formed on the basis of this experience. Therefore, the systemic organization of knowledge cannot be reduced to semantic paradigmatics of language, especially in its structuralist, atomistic interpretation.

The thinking and communicating society is the carrier of such distributed shared hidden knowledge. Thus, theoretically it is possible to obtain experimental data about the contents and structure of these hidden social cognitive representations in a special verbal form directly from the members of the society in the form of the different organized sets of meanings-concepts. The technique of obtaining the data in a cognitive-psycholinguistic experiment (stimuli, instructions, ways of fixing and processing the reactions, etc.) is developed with the reference to the general ideas of how cognitive mental representation is organized.

We proceed from an integral dynamic theory of knowledge representation that denies modularity (for eg. the separate blocks of episodic and semantic representation). Basing my argumentation on quantitative-qualitative interpretation of the category “similarity/difference” (I shall elaborate upon this in my report), I think that mental cognitive representation should be made not in a discrete-feature form, but in a continual-discrete parametric one that allows fixing dynamic *changes* through quantitative *difference*. Among the most important linear quantitative-qualitative parameters there is a parameter “concreteness-abstractedness” that fixes the *degree* of the concept generality from the concrete schematic-iconic ones to maximally

general (such as “something”) through any number of intermediate ranking levels: it is known that in different cultural-linguistic communities the content volume and, therefore, the degree of generality for similar concepts sometimes do not coincide. There is a great number of other quantitative-qualitative classifying evaluative concepts, such as “size” (microscopic-small-normal-big-huge-of a monstrous size), “weight”, “speed”, “age”, “distance” (in space, time), “emotional evaluation”, etc. Among these concepts there is also a parameter of positive-negative importance of the value concepts.

Parallel experimental work with Russian and Swedish respondents included the following stages.

— The selection of value nominations that are considered important for an individual and/or his/her community (getting an unorganized set of descriptors for this area of cognitive space). The data obtained were statistically processed and analyzed by a mixed Russian-Swedish group of experts to select more concrete concepts (for e.g. honesty), coinciding in their contents in the two communities, and abstract value concepts (for e.g. “poryadochnost”, “intelligentnost”) that do not coincide.

- The lists of abstract concepts whose volume and contents seemed different for the two communities were used as stimuli during the next stage of the study: respondents were asked to enumerate as key words hyponyms (“enumerate the concepts that are included into the given one”) for each abstract concept. After statistical processing of the results an additional list of concrete value concepts was compiled, it was a combination of the data from this stage with the results of the first stage of the research. Two parallel (Russian and Swedish) lists of concrete value nominations were created on this basis. These parallel unorganized lists describe the same area of the cognitive system, but they do not reflect the peculiarities of its inner organization.

- To obtain the data on continual-discrete organization of cognitive ethical systems according to one of the parameters the above-mentioned lists were used as a stimulus during the third stage of the study (*grading*). The respondents got a task to *rank* the positive value nominations from the most important to the least important for them personally. Statistic processing allowed *scaling* the continual parameter “value importance”. Comparison of the Russian and Swedish scales as well as of statistical distributions of the individual value nominations allowed structuring this area of the cognitive system and assessing similarity/difference of value nominations according to the importance parameter from the intercultural point of view and within

one culture from the point of view of the gender differences.

The report covers the data that prove the explanatory power of the theoretical model, based on continual-discrete quantitative-qualitative principles.

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EEG TIME-FREQUENCY ANALYSIS DURING THE ANTICIPATION PERIOD FOR NEUTRAL AND EMOTIONAL FACES IN PATIENTS WITH DEPRESSION AND HEALTHY CONTROLS

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We aimed at studying differences in brain electrical activity in patients with depression compared to healthy volunteers during anticipation of negative vs. neutral stimuli. Previously, we analyzed the slow potential (CNV) elicited by the cue presented before neutral or emotional face in the implicit emotion recognition task (Mnatsakanian et al., 2011) and found differences between depressive patients and controls. However, this analysis did not account for an induced activity, which is also related to emotion processing (Oya et al., 2002). In the present study, we applied time-frequency analysis to the same data set to see if the induced activity can add to our findings from slow wave study.

Healthy volunteers (12 female and 7 male) and patients (12 female and 7 male) performed visual categorization tasks. The stimuli were monochrome photographs of human and animal faces. Half of the images in either group were neutral and half were showing aggressive people or animals. The instruction for the task was to press button 1 for a human and button 2 for an animal face. The pictures in the Implicit task were preceded by the cues (4 types, one for each condition), which meaning was not explained to the participants.

128-channel EEG was recorded with 500Hz digitization rate. We analyzed the EEG recorded between cue and picture (duration was 2s) for the human faces only – categories HN (human neutral) and HE (human emotional). The data were reduced to 70 channels according to 10–10 system. Time-frequency analysis was done using Morlet wavelet with a center frequency of 1 and time resolution of 3 seconds, with the frequencies of interest ranging from 3 to 45 Hz with 1 Hz intervals between each frequency. Then results for single trials were

averaged for each channel in each individual recording separately. Wilcoxon paired test was performed on averaged individual data sets to find significant group differences in spectral power between categories in both patients and controls. As a result we obtained 70 time-frequency matrices (1 per channel) with Wilcoxon T values for each time-frequency point. The matrices for all channels were overlapped in a single plot, separately for patients and for controls, and were inspected visually to select clusters with significant group differences ($p < 0.05$) in time and frequency domains (Fig. 1). For each cluster, topographical locations of significant group differences were marked in 70-channel electrode montage.

In general, the number of clusters in the control group was lesser than in patients, and the spectral power was higher in response to the anticipation of emotional faces for all frequencies. The results were grouped into three frequency ranges: 10–20Hz, 20–35 Hz, 33–45Hz. However, the differences in the patient group were mainly observed in higher frequencies (25–45Hz) than in the control group (12–25Hz). In both groups, there were almost no differences in lower frequencies except for those around 5Hz in patients. In the control group, differences were generally observed in the right hemisphere, whereas in the patient group the differences were mainly located in the right anterior and left posterior scalp regions. Unlike the healthy controls, in patients significant differences were observed during the last 100 ms prior to face presentation in 10–16 Hz in prefrontal cortex and left posterior region. Major differences from cue onset to 1400 ms were found in patients in 20–35 Hz range, widespread on the scalp; and in controls, the differences in 19–34 Hz were clustered in the last 300 ms before the face presentation.

In the higher frequency range (33–45 Hz) during the anticipation of aggressive faces compared to neutral faces, our patients showed significant differences in the spectral power during 120–1640 ms with a general pattern of areas in right anterior

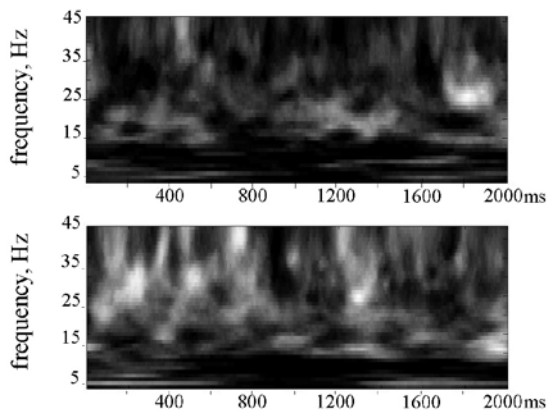


Fig. 1. Matrices of *T* values for 70 channels overlapped in a single plot for controls (on top) and patients (bottom). Shade in each point is proportional to the sum of *T* values through all channels, black color is for points with no significant differences. Horizontal axis is for time from cue onset to the picture onset.

and left posterior locations. Unlike patients, in the control group we found single cluster in 440–520 ms widespread on the scalp with strong right hemisphere preponderance.

Thus, we found increase in EEG spectral power during the anticipation of emotional stimuli compared to neutral stimuli, which is consistent with multiple literature sources on real aversive stimuli presentation. According to the literature, the EEG gamma activity is related to emotional stimuli processing, especially to aversive stimuli (e.g. Oya et al., 2002, Luo et al., 2007). However, we found this increase not only in the gamma range, but also in alpha and beta ranges. This may be due to anticipation itself or specific to the anticipation of emotional stimuli. Also, it looks like induced activity differences in patients and controls indicate similar patterns of brain areas, like those in our slow wave study (Mnatsakanian et al., 2011), and also add to our knowledge on the brain function in depression.

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EMOTIONAL INTELLIGENCE AND EMOTIONALITY

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Intelligence as traditionally described is not enough to determine if a person succeeds or not (Gardner, 1983). To predict overall success he suggested addressing alternative types of intelligences as well. According to Gardner, we should emphasize personal intelligence along with traditional intelligence. Mayer and Salovey (1997) developed the *Four Branch Model of Emotional Intelligence*, which includes (1) perceiving emotions accurately in oneself and others; (2) Using emotions to facilitate thinking; (3) understanding emotions and the signals conveyed by others and (4) managing emotions so as to attain specific goals. Another approach (Vernon, Pedrites, Bratko, & Schermer, 2008) sees emotional intelligence as a personal trait. H. J. Eysenk (1967) describes *emotionality* as a personality trait related to over-responsiveness and greater emotional arousability. People with high emotionality produce a stronger than average drive in emotion-provoking situations.

Research's goal: to describe the relations between emotional intelligence, emotionality, and several demographic factors, such as gender, academic achievement scores, family income, etc.

Hypothesis 1: Emotional intelligence and emotionality have a U-shaped relationship; both lower and higher rates of emotionality may predict lower emotional intelligence, and middle rates of emotionality may predict higher emotional intelligence.

Hypothesis 2: There will be a moderate correlation between Emotional Intelligence and academic achievement scores.

Hypothesis 3: Self-report test results will show higher emotionality rates for women than for men.

Sample: Ninety two full-time college students participated in this research. Among them, 66 participants were females and 26 were males. The mean age of participants was 19.6 (SD=1.094). The residence country of participants was the USA. First, the participants were asked several questions specifying their gender, age, family income (using given intervals), and academic achievement scores (SAT or ACT, both Math and Verbal). Emotional

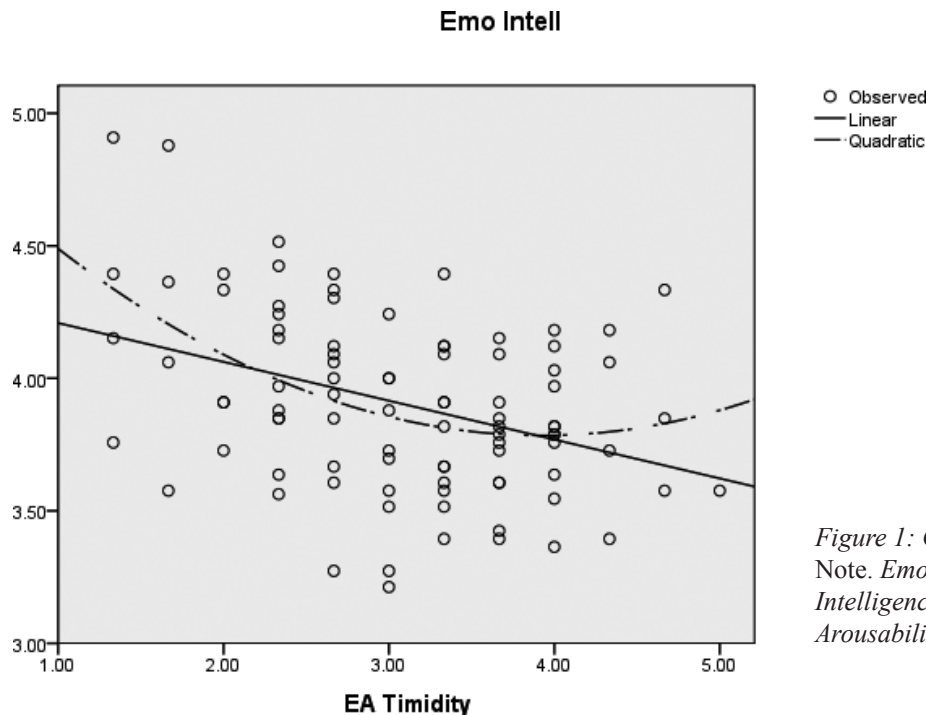


Figure 1: Curve fit.
Note. Emo Intell – Emotional Intelligence; EA – Emotional Arousability

Arousability was measured by the Scale of Emotional Arousability (SEA; Braithwaite, 1987). Emotional Intelligence was measured with the Schutte Self-Report Emotional-Intelligence.

The hypothesis of a positive correlation between Emotional Intelligence and SAT scores was partly validated. Such tendency was found for SAT-Verbal scores ($r=0.241$, $p<0.05$), but not for SAT-Math scores ($r=0.06$).

A negative relationship between Emotional Arousability and Emotional Intelligence was validated: there was a significant negative correlation between Emotional Intelligence and the General component of Emotional Arousability ($r=-0.38$, $p<0.01$), the Timidity component ($r=-0.395$, $p<0.01$), and the total score of Emotional Arousability ($r=-0.402$, $p<0.01$).

In order to explore the hypothesis of a U-shaped relationship between Emotional Intelligence and Emotionality a curve estimation was conducted. The analysis showed that the quadratic relationship fits better than linear relationship only for the case of the Timidity component of Emotional Arousability. However, our prediction was not upheld even for Timidity, as we found. Opposite relationship: both low and high Timidity predicted higher Emotional Intelligence, and moderate Timidity predicted lower Emotional Intelligence. Also, participants with low Timidity scores had higher Emotional Intelligence than participants with high Timidity scores (see Figure 1)

The negative correlations between Emotional Intelligence and General Emotionality and Timidity

might be explained by the nature of Emotional Intelligence. Emotional Intelligence might have more to do with logic than with emotions. Therefore, less overresponsiveness presents more opportunities for logic to be accurate. The findings with regard to correlations between Emotional Intelligence and SAT scores confirm the idea of the logical as opposed to emotional nature of emotional intelligence.

We found a U-shaped relationship between Timidity Component of Emotionality and Emotional Intelligence. The high scores on Emotional Intelligence might be influenced by the high courage to explore the relationships with other people. At the same time people with high timidity have more opportunities to observe other people because they are less communicative. Thus, people with moderate timidity might score a bit lower, than people with high or low emotional intelligence.

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INTENDED INCOHERENCE AS A SOURCE OF VERBAL IRONY

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Understanding irony

Understanding of irony in discourse is one of the cornerstone questions for modern theories of verbal irony. Pragmatic approaches to irony tend to explain the processes of ironic utterances comprehension via the concept of inference, that is, pure logical reasoning. Cognitive theories suggest other ways: irony can result from relevant inappropriateness or some other kinds of misfit. Inappropriateness emerges when presuppositions of an utterance are not compatible with the presuppositions of the context (Attardo 2007).

Another attempt to explain irony comprehension in cognitive terms comes from theories of verbal humor. Incongruity theories of humor treat irony (as one of the forms of humorous communication, which is a disputable point of view in itself) as a mismatch or contrast between two meanings. The idea of script opposition in understanding of jokes is developed in Viktor Raskin's seminal work (Raskin 1985).

Yet the manifestations of irony in discourse are very diverse, and none of the existing theories can embrace all instances of ironic communication.

In our research we apply the concept of (*in*) *coherence* to show how ironic meaning is created when the expected connectivity of different levels of discourse is intentionally violated.

The concept of (in) coherence and its application to verbal irony

The concept of *coherence* is famous for its vagueness and hence, its multiple interpretations. In discourse analysis and more formal approaches like Rhetorical Structure Theory the term is used for the description of topical sustainability and general connectivity of a text (Renkema 2009, Taboada 2009). Cognitive scientists and psychologists use the concept of coherence to explain the general processes of understanding (Thagard 2000). In fact, the gap between these two interpretations of coherence is not as wide as it might seem: a lot of what we understand comes with and through language use. Therefore, coherence as a cognitive phenomenon can be explained in linguistic terms.

Though coherence is one of the major properties of discourse, not all instances of our everyday verbal interactions are coherent. In what follows we focus on the counterpart of coherence – incoherence – and apply both concepts to instances of verbal irony. If an addressee faces incompatible

(i.e. incoherent) pieces of information, he/she has to balance them and find a reasonable explanation why two incoherent elements occurred in discourse together. When incoherence is recognized as intended (as opposed to unintended incoherence which can result from a mistake or some kind of a speech disorder), it triggers the search for additional implicit meanings.

Intended incoherence can result in ironic interpretation of an utterance or a text. Below we look at intended incoherence which arises from semantic, rhetorical or pragmatic properties of the utterance or the text.

Semantic incoherence is usually signaled by the lexical choice of the speaker (e.g. non-trivial morphemic or lexical collocations). The incoherence can also emerge when referents mentioned in the utterance belong to two incoherent cognitive domains. Their co-occurrence leads to intended disruption of topical unity. The following example illustrates this kind of incoherence:

A career faux-Democrat, and former member of the Scared Like a Bunny wing of the Democratic senatorial caucus, reappears from the netherworld of Loserdom to chew on his leg about his campaign to over-regulate small businesses [<http://www.esquire.com/blogs/politics/obama-mic-check-video-6595080>].

Irony emerges as a result of reference to at least three cognitive domains which are incoherent in the sense that normally they do not occur next to each other: politics, animal-like behavior and imaginary world. Their unexpected co-occurrence hampers coherence of the text and along with apparent negative evaluation it triggers ironic interpretation of the text.

While semantic incoherence is explicitly marked, incoherence caused by rhetoric and pragmatic properties of the text may not have overt linguistic signals. *Rhetorical incoherence* emerges when the expected order of verbal actions is intentionally broken. The case is illustrated by the fragment of a radio talk-show transcript:

Listener: Меня очень удивляет, почему Прохоров – умный мужчина? Что в нем умного? Он получил по залоговому аукциону НорильскНикель.

Journalist: А вы получили?

Listener: Нет.

Journalist: Ну вот, видите? Ему удалось, а вам нет.

Listener: Ну...

By violating the expected pattern of the dialogue (a question normally requires an answer)

the journalist breaks the rhetorical structure of the dialogue and makes it incoherent. The ironic interpretation of the dialogue comes from the fact that the negative evaluation “backfires” at the listener and she becomes the victim of her own criticism.

Irony can also emerge as a result of *pragmatic incoherence* when the what is said incoheres with the situation or general knowledge of the participants of discourse. To illustrate the point we will use the message published in one of the social networks:

OK, I thought I have seen it all: this is a reader on film theory which costs \$1,450.00. That is to say, FIFTEEN HUNDRED DOLLARS!!!! Course adoption, anyone?

The information about the unreasonably high price of a book intended for students incoheres with the general knowledge that students cannot afford expensive textbooks. The question suggesting making it a compulsory textbook for a university course comes as ironic evaluation of the pricing policy of the publisher.

To sum up, much of human cognitive activity can be understood in terms of coherence. Because we strive for coherence, we try to find a rational explanation when we face incoherence. In discourse intended incoherence can come from many sources (semantic, rhetorical or pragmatic) to signal the presence of implicit meanings. Ironic intention of a speaker can be a good explanation for intended incoherence, especially when it is accompanied by negative evaluation of a person, an object or a situation.

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SUBJECTIVE SCALES OF CONSCIOUSNESS: CAN WE HAVE SOME KNOWLEDGE ABOUT IMPLICIT KNOWLEDGE?

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There is controversy over whether knowledge acquired in implicit learning tasks is conscious. Recently, different scales have been introduced to measure the conscious status of this knowledge (Sandberg, Timmermans, Overgaard and Cleeremans 2010). One goal of this experiment was to check whether different consciousness scales can influence the way that subjects deal with implicit knowledge in Artificial Grammar Learning task (AGL). I.e. people might feel more encouraged to base their judgements on intuition if they are asked to assess their intuitive feelings about decisions they are making rather than to state their certainty. On the other hand the way subjects classify letter strings in AGL might be dependent on their awareness of structural knowledge about grammar rules and their judgement knowledge about the basis of their decision. When both types of knowledge are unconscious, subjects guess, however, if they are both conscious, subjects use memory, and if only judgement knowledge is conscious, subjects use intuition (Dienes and Scott 2005).

183 students took part in an Artificial Grammar Learning task. In this task subjects are initially presented with letter strings. In the next, classification phase subjects are told that the strings they saw were built according to a grammar rule which would not be revealed. At the same time they are asked to classify new letter string as grammatical or not. In this study participants were also asked to assess their decisions by rating certainty, intuitive feelings, conscious knowledge about the rule, or money wagering. After the test they were asked about the ways they dealt with the AGL task. The results showed that instructions did not influence subjects' classification method nor their performance. However, there was a relationship between the way subjects dealt with the task and their correctness. They were the least correct when claiming guessing and the most when they reported using remembered regularities of previously presented strings.

The results suggest that performance in AGL is related to the level of participants' awareness of the acquired knowledge. This is in line with Scott and Dienes (2005) showing that participants having conscious structural knowledge (memory and rule hypothesis) perform better than participants basing their judgements on unconscious structural

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THE ROLE OF AFFECT IN METACOGNITIVE JUDGEMENTS AND PERFORMANCE DURING THE PROBLEM SOLVING PROCESS

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In a set of experiments we attempted to explore the relationship between intuition and emotion and the role they play in the process of problem solving. Intuition can be described as a feeling, knowledge or belief about one's cognitive states, that is, a kind of metacognition that produces hunches, guesses and feelings (Dorfman, Shames and Kihlstrom 2004, Metcalfe 1986). Several studies suggest that intuitive judgements in different types of cognitive tasks are accurate and that, at least in some cases, they might be based on simple affective processes (Bowers, Regehr, Baithazard and Parker 1990, Siedlecka and Nęcka 2009, Tichomirow 1976). A positive or negative affect can be the effect of progress monitoring or accessing implicit knowledge and might serve as a subtle cue about "being right" (Bechara, Damasio, Tranel and Damasio 1997, Jaušovec and Bakracevic 1995).

In the first study we examined the influence of externally and subliminally implemented affect on intuitive feelings about approaching the solution of difficult problems ("feeling of warmth"). 130 students of Jagiellonian University were asked to solve two problems and give their feeling of warmth ratings every 15 s. They were also subliminally shown pictures of faces expressing emotions (negative, positive and neutral). We used two different ways of inducing unconscious affect: central, very brief presentation of photographs and longer, peripheral presentation. The results suggest that it is possible to bias people's intuitive feelings

by external affective stimuli (especially if they are peripheral). That means that subtle affective changes might be the core of intuitive feelings.

In the second experiment we tried to explore the influence of externally implemented affect not only on the accuracy of intuitive judgements but also on problem solving efficiency. 60 students of Jagiellonian University were asked to solve two problems and give their "feeling of warmth" ratings. We used the method of eliciting unconscious affect that gave better results in experiment 1. In one condition we induced only negative or only positive affective responses. We assumed that participants presented with negative stimulation would be less satisfied with their results therefore they would be working longer and more efficiently than participants in the positive affect condition. The data are currently being analyzed.

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A HYPOTHETICAL MECHANISM FOR INTEGRATIVE PERCEPTION OF “WHAT – WHEN” ASSOCIATIONS

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The ability of organisms to estimate time and temporal sequences is vital for ability to adapt to the environmental conditions. Experimental data demonstrate that not only higher cortical areas, but also specific sensory cortical areas are involved in temporal processing. On the basis of available data, a conclusion has been made that neural representation of time is distributed across a network of brain regions. The most widespread hypothesis implies existence of a neural pacemaker i.e. “internal clock” and accumulator (pacemaker-accumulator timing model, PA). Existing data led to speculation that time counting can emerge as a product of coding of events in cortico – basal ganglia (BG) circuits and depends on dopamine level. An involvement of the BG in time perception is a key assumption of recently developed Striatal Beat Frequency (SBF) model, in which perception of intervals is based on excitation of projecting striatal spiny cells by cortical oscillators (Meck et al., 2008). However, SBF model has some disadvantages. In this model, encoding of intervals between sensory stimuli is performed in the striatum, whereas parameters “what” most probably are encoded in sensory cortical areas. Since striatal spiny neurons, as well as their target cells are GABAergic, and therefore cannot transmit excitation it is unclear where and how parameters “what” and “when” are integrated. In the SBF model, dopamine potentiates the efficacy of cortico-striatal inputs thus increasing activity of spiny cells. However, a sign of modification depends on the type of striatal cell, because dopamine D1 receptors (which activation promotes potentiation) are preferentially expressed by striatonigral cells, whereas receptors D2 (which activation promotes depression) are expressed by striatopallidal cells.

We suggest a hypothetical mechanism of integrative perception of associations “what – when” which is free from mentioned weakness of SBF model. Proposed mechanism is based on a postulate that the parameter “when”, characterising time of stimulus arriving is processed together with physical properties of this stimulus, i.e. parameters “what” (e.g. colour, shape, frequency of a sound, etc.). We also assume that in result of this processing neural representations of associations “what – when” are generated in those cortical areas wherein properties

“what” are perceived. Taking into account current opinion that the basic mechanism for subjective experience is the reentrance of excitation into the nervous structures, we suppose that repeated excitation of neocortical areas is required for perception of “what – when” associations.

A possible mechanism for generation of neocortical representations of properties “what” for stimuli of visual modality we have suggested earlier (Silkis 2007, Biosyst). According to this mechanism, mentioned representations are formed owing to dopamine-dependent changes in activity in neuronal loops neocortex – basal ganglia – thalamus – neocortex (C – BG – Th – C) (Fig. 1). Due to opposite character of modulatory action of dopamine at cortical inputs which “strongly” and “weakly” excite striatal cells, a contrasting amplification of activity in the neocortical representation of stimulus property could be achieved (Silkis 2007). Since this mechanism does not depend on what of sensory cortical area (visual, auditory or tactile) and its subcortical targets are included in the loop it is in agreement with the assumption that a role of the BG in information processing is non-specific in relation to stimulus modality.

We also put forward a hypothesis that a rate of subsecond “internal clock” is inversely proportional to the time of repeated neocortical excitation via the cortico – subthalamo – pedunculopontine – thalamocortical loop (Fig. 1).

Scheme of neural network participating in generation of associations “what – when” in neocortical areas. BG, basal ganglia; MDN – mediodorsal thalamic nucleus; VTA, ventral tegmental area; SNc, substantia nigra pars compacta; STN, subthalamic nucleus; PPN, pedunculopontine nucleus; SC, superior colliculus. DA, dopamine. Solid lines with arrows, excitatory inputs; dotted lines with rhombs, weak inhibitory inputs; dashed lines with arrows, dopaminergic inputs; dash-and-dot lines with arrows, loops of repeated neocortical excitation.

Clock rate is regulated by dopamine-dependent modulation of functioning of C – BG – Th – C loops that promote disinhibition of subcortical elements of excitatory loops. Duration of perceived interval is proportional to the number and length of cycles of repeated neocortical excitation. Time counting could be encoded by the number of neuronal discharges, and accumulated in the neocortex. Involuntary (or voluntary) counting is triggered by stimulus (or by the prefrontal cortex). We quantitatively estimated a time necessary for stimulus evoked

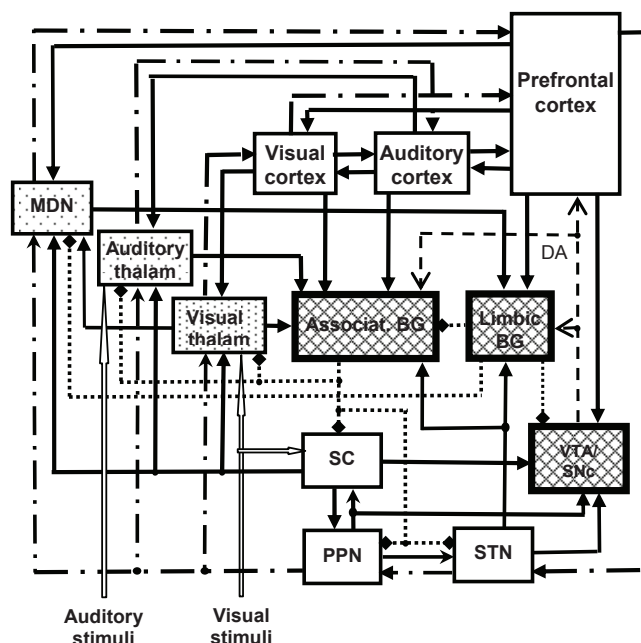


Fig. 1. Scheme of neural network participating in generation of associations "what – when" in neocortical areas. BG, basal ganglia; MDN – mediodorsal thalamic nucleus; VTA, ventral tegmental area; SNc, substantia nigra pars compacta; STN, subthalamic nucleus; PPN, pedunculopontine nucleus; SC, superior colliculus. DA, dopamine. Solid lines with arrows, excitatory inputs; dotted lines with rhombs, weak inhibitory inputs; dashed lines with arrows, dopaminergic inputs; dash-and-dot lines with arrows, loops of repeated neocortical excitation.

repeated excitation of cortical neurons. Based on our observation of bimodal distribution of latencies of responses of individual neurons of cat visual cortical area V2 to a light flash, in which interval between first and second short latency peaks was 20–25 ms (Sil'kis and Rapoport, 1983), we assume that this interval is required for repeated neocortical excitation. Because of this it is difficult to differentiate intervals shorter than 20–30 ms. Indeed, the ability of humans to perceive temporal order for pairs of auditory and visual stimuli was found to be correct only if inter-stimulus intervals were longer than 40 ms.

Proposed mechanism is identical for stimuli of different sensory modalities owing to similarity of functioning of topically organised parallel

C – BG – Th – C loops. From our model follows that the more (or less) concentration of dopamine in the input BG nucleus, striatum, the stronger (or weaker) thalamic disinhibition, the higher (or lower) clock rate, and real interval could be perceived as longer (or shorter). These consequences of proposed model are in agreement with known role of dopamine in subsecond interval perception.

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INDIAN PERSPECTIVES ON INTELLIGENCE: SOME PSYCHOLOGICAL AND PHILOSOPHICAL EVIDENCES

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The present theoretical article presents the Indian views on intelligence. Traditionally the study of intelligence has been considered an important field of investigation from the psychometric perspective. In recent years, process models of intelligence have received greater attention. In the Indian context, researchers have treated intelligence in terms of a dependent variable as well as a process. In the Indian philosophical tradition, intelligence is discussed

as an important epistemic concept. According to Srivastava and Misra (2000, 2001) intelligence in the Indian philosophical treatise has been considered as a state, a process, and an entity, the realization of which depends upon on one's own effort, persistence, and motivation. Current research in India shows the continuity of the concept from ancient times as reflected in the folk concept of intelligence.

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ACCOUNTING FOR LANGUAGE ASYMMETRIES VIA CONCEPTUAL METAPHORS: FROM TRIER TO ROSCH AND FURTHER

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Cognitive research into categorization has made evident the asymmetric structure of natural language. Scholars no longer entertain the idea of language as a regular, hierarchical, neatly-patterned system with clear-cut divisions, non-overlapping classes and units bearing equal status within these classes. Cognitivists, however, were by no means the first to discover this.

Long before cognitive linguistics came into being, the fact had been brought to attention by proponents of field theory, on the one hand, and members of Prague linguistic circle, on the other. To express the idea, both traditions employed an array of metaphors, among which two major types stand out clearly. One of them is metaphors which have static spatial configurations as their source domain and thus make use of such notions as *centre*, *core*, *periphery*, *zone*, *boundaries*, *adjacency*, *neighbours*, etc. This kind of metaphors was introduced by Günther Ipsen and Jost Trier, the founding fathers of field theory. The very concept of *field*, incidentally, was an obvious metaphor – a fact that both scholars explicitly recognized. Trier then applied the notion of *field* to the domain of lexical semantics, in particular to his studies of Old High German words referring to man's intellectual capacities. Impressed by Trier's elaborations, other German scholars of the inter-war period picked up the *field* concept as well as the above metaphors.

Interestingly, a few decades later, similar metaphors emerged in quite a different context, that is in cognitive studies of categorization. Following Eleanor Rosch's groundbreaking prototype theory, scholars started inquiring into the nature of various kinds of categories, linguistic ones included. In discussing their findings, they also resorted to static spatial metaphors, cf. George Lakoff's (1987) radial

categories and cluster models, or John Taylor's (1989) detailed discussion of prototype effects in linguistic categories of various ranks. Besides, numerous semantic networks have been designed by cognitivists to account for lexical polysemy which not only operate with the notions of *centre*, *periphery*, *extensions*, *distance*, but also lend graphical support for these notions.

The other major type of metaphors seems to have originated in Prague linguistic circle. In the works of Czech scholars spatial images are present, too, but they are subsumed into more complex force-dynamics metaphors, activating the physical notions of *density*, *balance*, and *gravitation*. The same type of metaphors is abundant in some works by Sergej Karcevskij and André Martinet, which is no surprise given that both were much under the influence of Prague linguistics. Thus, in speaking of Russian morphological verb classes Karcevskij employed the notions of *energy*, *force*, *radiation*, *attraction*. With Martinet, the range of metaphors was even wider, including those of *shift*, *drift*, *deviation*, *penetration*, *expansion*, *pressure*, *attraction*, *repulsion*, *chain reaction*, etc. One may prompt a suggestion that such an extensive use of physical metaphors may have been due to significant achievements in nuclear physics after World War II.

Cognitive linguistics claims that metaphors are part of human conceptual system rather than simply ornate linguistic expressions designed to make language more rich and persuasive. Under this view, it is noteworthy that both types of metaphors concerned rely on space and motion as their source domains, that is, evoke fundamental spheres of man's everyday experience.

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FREQUENT MISTAKES IN RUSSIAN VERB FORMS AS A WINDOW ON THE STRUCTURE OF THE MENTAL LEXICON

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The study of the mental lexicon lies at the heart of psycholinguistics. One of the central questions in this domain concerns different forms of a word: how are they processed and stored? Several problems have been extensively discussed over the last couple of decades (in particular, whether regular and irregular morphology is processed by two distinct mechanisms, or by a single mechanism; which morphologically complex forms are decomposed and which ones are stored as a whole). But relatively little attention has been paid so far to the internal structure of complex paradigms, probably, due to the fact that most studies were conducted on morphologically poor languages, primarily on English. Many interesting questions can be raised here: e.g. what is the status of different rules inside a paradigm, how are different forms connected? In the present study, we address some of them analyzing several types of frequently occurring mistakes in Russian verbs forms.

Firstly, we look at consonant alternations, such as *s//š*, *v//vl* etc. Historically, they were present both in verbal and in nominal paradigms, as well as in derived words. Nominal paradigms got rid of them, with several exceptions. Notably, apart from frozen forms like *bože* from *bog* 'god', all such cases resemble the word *suk* 'bough, knot', where all Singular forms share one stem (*suk-*) and all Plural forms have another one (*sučj-*). This fact and some other cases below indicate that psycholinguistically, the paradigm is subdivided into Singular and Plural, and the connections between forms are stronger inside these two groups.

In verbal paradigms, consonant alternations are present in several non-productive classes and in one productive class. It is the 1st subclass of the 10th class in the *Russian grammar* (Shvedova, ed., 1980), or I-class in (Jakobson 1948; Townsend 1975). Henceforth we will use the latter shorter term. I-class has consonant alternations in the 1sg present/future tense form and in the passive past participle (e.g. *brošit'* 'to throw' – *brošu* – *brošennyj*).

Internet searches reveal that novel verbs in the I-class, such as *fotošopit'* 'to photoshop', *tusit'* 'to hang out, to party' and many others, mostly substandard, are often used without alternations, or, more surprisingly, with alternations unevidenced in

literary Russian. E.g. *frendju*, *frendlju*, *frendžu* from *frendit'* 'to include in the friend list' are often found instead of the expected *frenžu*. The 1sg form is derived incorrectly significantly more often than the passive past participle. E.g. if we take *otfotošopit'*, about 25% of 1sg forms lack alternations, compared to about 15% of passive past participles.

Non-novel verbs in the I-class, including infrequent ones, as well as verbs from non-productive classes, rarely miss alternations, although a number of mistakes can be found. Some verbs have substandard finite forms (but not participles!) without alternations: e.g. *žgeš'*, *žget...* instead of *žžeš'*, *žžet* from *žeč'* 'to burn'. The fact that some of these mistakes are deliberate and are made to parody substandard speech is telling by itself. The only exceptions are several non-novel verbs that lack a normative 1sg form due to a historical accident, e.g. *pobedit'* 'to win'. If 1sg forms from such verbs are used nevertheless, they are without alternations in the majority of cases.

In addition to this, the data from a previously conducted experiment (Gor and Chernigovskaya 2001; Slioussar 2001) were analyzed with respect to consonant alternations. 48 pseudoverbs, including ten verbs compatible with I-class, were used in the experimental dialogues, prompting subjects to generate 3pl and 1sg forms from the pl past tense form. Out of the forms derived according to the I-class rules, 52% lacked alternations. Moreover, two subjects generated alternations never evidenced in Russian (like *s//sl*, *d//dl*).

Thus, the tendency to get rid of alternations shows up wherever it is not counteracted by the prescriptive norm: in the cases where a normative form does not exist in literary Russian, in novel words that have not entered literary Russian yet and in pseudowords. We argue that 1sg forms lose alternations more easily than passive past participles because the latter have a paradigm of their own inside the verbal paradigm, being inflected for case, number and gender. All forms in this paradigm share the stem with alternations. For 1sg forms, the pressure to get rid of alternations is much stronger because other forms in the present/future tense paradigm lack them. We will also analyse other factors influencing the loss of alternations in the talk (e.g. some consonants are more prone to it than the others; alternations are always absent if a novel borrowed verb is written in Latin letters etc.)

Interestingly, I-class is also the only productive class that belongs to the 2nd conjugation type. Mistakes in the conjugation type show a different

pattern. In non-novel verbs they are made more often than alternation mistakes, but their frequency does not increase in novel verbs. They were also quite rare in the experiment mentioned above. Thus, the conjugation type is firmly tied with the verb class, and native speakers make mistakes only when they are not sure to which class the verb belongs.

Another case discussed in this talk concerns stress shifts within verbal paradigms. Russian verbs may have different stress patterns in the past tense and present/future tense paradigms: *a* (all stresses

on the stem), *b* (all stresses on endings, wherever they are non-zero) and *c* (mixed pattern). According to the database of Russian verbs created by Natalia Slioussar on the basis of *The grammatical dictionary of Russian* (Zaliznyak 1977) (www.slioussar.ru/verbdatabase.htm), all three stress patterns are considerably frequent in the present/future tense, while in the past tense, the *b* and *c* patterns can be found only in a small number of verbs from several non-productive classes:

b: *be'reč'* 'to protect': *be'reg* (sg masc), *bereg'la* (sg fem), *bereg'lo* (sg neut), *bereg'li* (pl)
c: *so'rval'* 'to pluck': *so'rval* (sg masc), *sorva'la* (sg fem), *so'rvalo* (sg neut), *so'rvali* (pl)

As examples above show, in both stress patterns there is one form where the stem differs from the others. In the *c* stress pattern, it is the sg fem form, in the *b* stress pattern, it is the sg masc form with zero ending. Almost all verbs with the *c* stress pattern have substandard forms with stress shifts. Firstly, they have a sg fem form with the stress on the stem (e.g. *so'rvala*). This is expected: then all forms in the paradigm share the same stem. Secondly, many verbs also have a substandard sg neut form with the stress on the ending (e.g. *sorva'lo*). This shows that regularization is not necessarily unidirectional, different forms changed to achieve uniformity may coexist, and that this process may affect only a part of the paradigm: Plural forms do not have variants with stress shifts. It is also interesting that this process is not impeded by the fact that sg masc forms with zero endings cannot undergo stress shift.

Analogous processes do not take place in the *b* stress pattern, which is expected: the only form with the stress on the stem cannot be changed to

resemble the others. However, there is substandard regularization on a different level. E.g. all verbs in the D-T-class (1st subclass of the 7th class in the *Russian grammar*) belong to the *b* stress pattern in the past tense, except for *klast'* 'to put' and *krast'* 'to steal' and their prefixed derivatives. In substandard Russian, these exceptions are 'corrected'.

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OSCILLATORY MECHANISMS UNDERLYING WORKING MEMORY CAPACITY

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Working memory (WM) is a neurocognitive mechanism responsible for the active maintenance of information for the purpose of its ongoing – often complex – processing. The most important feature of WM is its heavily limited capacity. Usually, a person can maintain from two up to six items in

WM, with a mean individual capacity equaling four items (Cowan, 2001).

Recently, formal models, which describe storage as some kind of a pattern of fast oscillations, appeared to be the most promising theoretical approach to WM's functioning and its limits (Edin et al., 2009; Jensen & Lisman, 1998; Usher, Cohen, Haarmann, & Horn, 2001), which explains how the different features of a maintained item are being bound together (Hummel & Holyoak, 2003; Raffone & Wolters, 1998). Such models naturally explain capacity limits as an emergent property of WM: as brain uses temporal coding for separating representations in WM, and time is a very limited

resource, brain is not able to pack too many oscillations into one interval, because they start to overlap and so they stop being distinctive. However, existing oscillatory models do not explain the fact that *people do differ in capacity*. We present a novel formal model of WM and we demonstrate which its features are responsible for individual differences in WM capacity.

The model consists of a buffer, which contains a certain number of elements (neuronal assemblies). A level of internal activation x_i (within $[0, 1]$ range) is assigned to each element i . The external output y of the element i in time t has been defined using a commonly applied sigmoid function of x_i , according to the following graded threshold function [1]:

Changes in levels of activation of elements are controlled by the following equation [2]:

Parameter λ controls how much element i is autoactivated by the recurrent connections feeding its output back into it. Index k denotes elements which output at the similar levels as element i does, namely in $[y_i - \kappa, y_i + \kappa]$ range. So, parameter α determines how much the outputs of elements, which oscillate close to element i , increase its activation. This accounts for the known fact that neurons which fire in synchrony with a given neuron strongly influence its potential. Parameter κ defines the temporal resolution of bindings: the larger κ , the more distant (in terms of activation) elements will be considered by the model as bound within the same representation.

Index j denotes elements which are not k nor i elements, namely those that fall out of $[y_i - \kappa, y_i + \kappa]$ range. These elements encode representations separate from a representation encoded by the elements i and k . Parameter β controls the strength of inhibition exerted by elements j , which decreases the activation of element i . How much element j inhibits element i depends on a difference in the elements' activity: a relatively more active element will inhibit element i more strongly than will do a less active one. The last part of equation [2] consists of a noise ε .

The activations and outputs of elements are updated in discrete cycles. As soon as an output of an element reaches unity (this reflects firing of a neuronal assembly), the parameter λ for that element is temporarily changed to a negative value, which makes this element quickly fall below a base level of activation (this reflects the phenomenon of refraction). Then, the value of λ is being reset to a default value and the element starts rising its activation above the base level.

We applied a few pairs of elements (an item identity and its context) to the model. Two elements constituting one pair were being added to the

buffer in the same time. The aim of the model was to maintain as many separate pairs of oscillations as possible for a given interval. At the end of the interval, a probe in a particular context was being presented. The model tried to find in its buffer a pair matching a probe and its context and it decided if it has seen that item.

In the model, the capacity limit arose naturally because addition of consecutive pairs increased the strength of total inhibition that each element received. When this value surpassed elements' activation, the elements with the lowest activation started falling out of the buffer. Thus, β was the main parameter influencing the model's capacity. The model predicted that a maximum capacity would be achieved at no inhibition ($\beta = 0$). In such a case, the model was able to maintain twelve pairs. By gradually increasing β , we were able to decrease the model's capacity.

We measured the (normal) distribution of WM capacity estimates (k) in the sample of 168 young participants, who fulfilled a specific WM task. These estimates are believed to closely approximate the actual number of items held in WM by an individual (Rouder, Morey, Morey, Cowan, 2011). The value of $\beta = .0026$ allowed us to replicate a mean k value in the sample ($M k_{sim} = 3.01$, $M k_{obs} = 2.92$). In order to simulate 168 individual results we varied parameter β , drawing its value for each individual simulation from the normal distribution, with $M = .0026$, and $SD = .0004$. The observed and simulated distributions did not differ significantly ($\chi^2 = 6.97$, $df = 7$, $p = .431$). R^2 value for observed and simulated data equaled .93. Minimum capacity was close to one item, while maximum capacity approached five items.

Thus, using a novel oscillatory model, we have shown that variation in the strength of lateral inhibition among oscillating representations in WM allows for accounting for individual differences in WM capacity. In our view, the brain's ability to control (decrease) the level of inhibition within WM constitutes a crucial mechanism allowing brain for active maintenance of as much separate representations as possible. The results of the study suggest that the concepts of oscillations and of bindings can have a great explanatory power in regard to WM.

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VECTOR PSYCHOPHYSIOLOGY: FROM BEHAVIOR TO NEURON

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1. Vector Psychophysiology: Basic Ideas.

A challenging task of the neuroscience is to reveal neuronal basis of subjective phenomena. Attempting to integrate neuronal processes with their behavioral and subjective manifestations a spherical model of cognitive and executive operations was suggested (Sokolov 2003, 2010). Specific cognitive events and intentions to perform particular acts are represented on the hypersphere in the four-dimensional Euclidean space. Four Cartesian coordinates of points representing cognitive events on the hypersphere correspond to excitations of four neuronal channels constituting an input excitation vector of a constant length (Sokolov 2003). Spherical coordinates of cognitive events (three angles of the hypersphere) refer to subjective scales. The cognitive hypersphere is characterized by a multilayered isomorphic structure encoding percepts, memories and semantics. Respective cognitive events are represented on the spherical layers by specific neurons (detectors and gnostic units). Subjective differences between particular cognitive events correspond to distances between their locations on the hypersphere and are “neurocomputed” as absolute values of differences between vectors encoding respective cognitive events. The input stimuli are transformed into excitation vectors and projected on the hypersphere constituting a cognitive neuronal map.

2. Spherical Model of Colour Vision.

2.1. Colour space of human trichromats: from subjective colour differences to colour excitation vectors. The presented general cognitive model suggests that colours in particular are encoded by four-dimensional excitation vectors. Subjective colour differences correspond to absolute values of vectorial differences between respective colours. It assumes that coordinates of colour-coding vectors can be extracted from a matrix of subjective

differences. Indeed, the multidimensional scaling of a matrix of subjective colour differences has shown that colours varying in hue, lightness and saturation are encoded by four-dimensional vectors of a constant length, so that specific colour are located on a hypersphere in the four-dimensional Euclidean space. The Cartesian coordinates of colour stimuli correspond to four colour-coding neurons found in lateral geniculate body of primates. Distances between ends of colour coding vectors found from a matrix of subjective colour differences closely correlate with subjective colour differences of the experimental matrix supporting vectorial encoding of colours. Spherical coordinates of colours (three angles of the colour hypersphere) refer to hue, lightness and saturation, respectively (Izmailov, Sokolov, Chernorizov 1989).

2.2. Colour space in animals: from instrumental colour learning in carp to its colour space. Carp has a trichromatic colour vision demonstrated in instrumental learning. Using a particular colour as a conditional stimulus interposed randomly with differential colour stimuli one can obtain a vector of response probabilities. Repeating experiments with different colours used as conditional stimuli one find a confusion matrix. The cells of the matrix correspond to response probabilities. Principal component analysis of the carp’s confusion matrix has demonstrated a hypersphere in the four-dimensional colour space. Colour excitation vectors found from the response probability matrix enable to compute inner products of a conditional stimulus and differential stimuli. The inner products computed from conditional stimulus excitation vector and excitation vectors of differential stimuli used in parallel closely correlate with respective response probabilities. Such a correlation implies that vector code of colour stimuli modifies accordingly synaptic contacts that have to be organised also as weight vectors. These weight vectors of plastic synapses refer to a command neuron triggering instrumental conditioned reflexes (Latanov et.al. 2000).

2.3. Four-dimensional colour space at bipolar cells of carp retina. To get information concerning neuronal basis of the four-dimensional colour space found from instrumental conditional reflexes in carp intracellular recordings from bipolar cells of an isolated carp retina were perfused using monochromatic light stimuli (Chernorizov, Sokolov 2001). It was found six types of bipolar cells with receptive fields having an antagonistic organisation of “centre-periphery”. “Red+ green-” and “red_ green+” were depolarised on “either – or” basis. The same refers to “yellow+ blue-” and “yellow-blue+” cells. In a certain degree were depolarised “brightness” and “darkness” neurons. Thus maximum four bipolar cells were depolarised by any colour stimulus. It means that colour stimuli are represented at the level of bipolar cells with excitation vectors having four coordinates: two coordinates refer to colour opponent cells and two ones – to cells having no colour opponency. The sum of squared amplitudes of their depolarisation for any wavelength of the input stimulus was equal to a constant value demonstrating constant lengths of colour excitation vectors. Thus, bipolar cells constitute a basis of four-dimensional colour space in carp. An additional test for correspondence of directly recorded responses of bipolar cells and components of excitation vectors extracted from behavioural experiments can be done by comparison of “neuronal” and “behavioural” colour spaces. The coincidence of colour points found by intracellular recording and by behavioural experiment on the hypersphere in the four-dimensional space strongly supports contribution of vector code in perception of colours and colour conditioning.

3. Spherical Model of Achromatic Vision: Monochromatic Vision in Snail. A natural model of monochromatic vision is the visual system of snails. Rodopsin is a single pigment expressed in photoreceptors of *Helix*. Two types of photoreceptors with depolarizing and hyperpolarizing responses are distinguished in snails however. In insects

photoreceptors are depolarized by light due to opening of sodium ionic channels. In vertebrates photoreceptors are hyperpolarized by light. In snail one sees a combination of both types of photoreceptors. Thus a light stimulus evokes a combination of depolarizing and hyperpolarizing responses in two subsets of photoreceptors assuming two-dimensional vector encoding similar to encoding of achromatic colours in normal human trichromats or light encoding of rod and cone human monochromats. The two-dimensional colour space in snails has a spherical structure constituting a semicircle along which different light intensities are located (Chernorizov, Sokolov 2010; Chernorizov, Shekhter 2011). It might be assumed that two-dimensional encoding of light intensity by excitation vectors of a constant length is used for selective activation of intensity detectors and elaboration of selective conditioned reflexes to light intensity. Comparison of colour vision at different level of evolution demonstrates universal principles of vector encoding in the framework of a spherical model.

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EEG DIFFERENCES IN HIGH AND LOW CREATIVE SUBJECTS

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The term “creativity” is considered as an ability to produce something new (e.g. original ideas), to break away from stereotypes and traditional

schemes in thinking and to find a quick optimal solutions in problem situations. Distinguished are 3 psychological parameters of creativity: fluency, flexibility and originality. These parameters of creativity are important characteristics to understand how successfully process of creativity proceeds. Fluency is considered as quantity of ideas proposed by subject. Flexibility is considered as quantity of different categories to which proposed ideas

can be referred. Originality is unusualness of idea proposed. However, creativity tests are designed in a such way that the each test task measures all the creativity parameters (fluency, flexibility and originality), with no separation of these parameters. Most of psychophysiological studies of creativity were performed using the creativity tasks with no separation of these parameters. Also there is no data about brain differences in high and low creative persons during performance creative tasks, involving separate parameters of creativity.

The aims of our study was 1) to elaborate original test for creativity parameters such as fluency, flexibility and originality, which were measured separately in each task and were suitable for further psychophysiological research 2) to investigate the EEG differences in high and low creative subjects during performance our test.

Three types of tasks were developed. Sets of 11 nouns in each task served as stimuli. The Fluency task was to create as much as possible interrelated sentences using appearing words from one semantic area. The Flexibility task was to create interrelated sentences using appearing words from different semantic areas. The Originality task was to create interrelated sentences in unusual way using appearing words from one semantic area. The 15 healthy volunteers participated in investigation. When the subjects performed tasks, the vegetative characteristics (heart rate, skin potentials) were measured. Analysis of vegetative characteristics revealed that there is no statistically significance differences between creativity tasks. Statistically significance differences were revealed only in comparisons for each creative task versus rest. According to self-reports of volunteers, the quantitative characteristics for fluency, flexibility and originality were calculated. In order to compare the validity of our test to the standard creativity tests we adjust to Spearman's rank correlation ($r = 0.66$ at $p < 0.05$). It indicates that our test correlate the standard test. So, we may suppose that our test measures the same psychological feature (creativity) as a standard test. Therefore we can use our test of creativity parameters for psychophysiological research. Using our test for further psychophysiological study may allow us to obtain more authentic view on brain organization of separate creativity parameters.

Healthy volunteers – 23 high creative и 27 low creative subjects – undergone computer EEG registration while being tested. EEG was recorded from 19 sites (10–20 system) in seven frequency bands. The volunteers' level of creativity (high or low) was measured according to Torrance Creativity Test (verbal battery). Statistically significance EEG

differences in high and low creative subjects for each of creativity parameters tasks vs control were revealed.

High creative subjects were characterized

- by solitary decreasing of EEG power in alfa2, beta, gamma bands for fluency, general decreasing in alfa2 band for flexibility and general increasing in gamma band for originality
- increasing intra- and interhemispheric connections for all types of creative tasks in high frequency bands.

Low creative subjects were characterized

- by general increasing of EEG power in beta2 and gamma bands for fluency and flexibility, and solitary decreasing in gamma band for originality
- increasing interhemispheric connections in anterior part and decreasing interhemispheric connections in posterior part for all types of creative tasks in high frequency bands.

The first interesting finding is that each of creativity parameters is maintained the own variance of EEG power for high creative subjects whereas the low creative subjects demonstrate the same EEG pattern for fluency and flexibility. We suppose that this fact reflects use of different cognitive strategies during solving the different types of creative tasks by high creative subjects. The second interesting finding is the presence of multidirectional differences in high and low creative subjects for each creativity parameters – for example, flexibility is characterized decreasing of EEG power in high creative subjects and increasing in low creative subjects. We suppose that this fact reflects the differences of brain functional states in high and low creative persons during the solving the same type of creative task. For example, flexibility task is difficult for low creative subjects and demands the involvement of all the brain resources – such as memory, attention, associative process, concentration, and so on, in order to find the answer. It reflects in increasing of EEG power in high frequency bands.

The third interesting finding is that creative activity for high creative subjects are maintained by both hemispheres.

EEG differences in high and low creative persons during performance of the tasks for creativity parameters were revealed. Our results indicate that there is different brain maintenance for high and low creative subjects during performance of creative tasks.

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MORPHOLOGICAL PROCESSING IN READING RUSSIAN: EVIDENCE FROM EYE MOVEMENTS

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A great deal of recent research on eye movements during reading has focused on the effects of the specific linguistic characteristics of various languages on eye movements. It has been observed that results vary cross-linguistically, especially in the area of morphological processing. Evidence suggests that morphological information is not extracted parafoveally in English (Lima 1987, Kambe 2004) and Finnish (Bertram and Hyöna 2003, Hyöna et al. 2004); however, verbal root and patterns are processed parafoveally in Hebrew, which has non-linear morphology (Deutsch et al. 2003, Deutsch et al. 2005). Readers in English compute the probability of the syntactic category for the upcoming word based on the processed information, and this computation affects foveal processing (Staub and Clifton 2006, Staub et al.

Table 1. The vertical line indicates the position of the invisible boundary (before the target word).

Materials: Five-character Russian nouns were chosen as stimuli. Materials were balanced for word and lexeme frequencies. The boundary change was always before the target word.

Design: Word order was held constant across all conditions. The target position in the sentence was manipulated (Subject x Object) together with the parafoveal preview (identical x morphologically related x non-word), resulting in a 2 X 3 Latin Square design.

Participants: 30 native speakers of Russian residing or visiting in Urbana-Champaign area.

Apparatus: Eye movements were recorded via an SR Research Eyelink 1000 eye tracker.

Predictions: No effect of parafoveal preview manipulations constitutes an absence of morphological processing in the parafovea. Longer times for the non-word compared to identical and, perhaps, morphologically related conditions

Target position	Preview		Target	
VSQ:	Identical	После обеда видит барин After lunch saw master	слугу ACC	у окна. by the window.
	Related		слуга NOM	
	Control		слугд nonword servant	
VSQ:	Identical	После обеда видит After lunch saw	слуга NOM	барина ACC у окна. master ACC by the window.
	Related		слугу ACC	
	Control		слугд nonword servant	

Table 1. Experimental Conditions

2007). Syntactic effects on parafoveal processing seem to interact with word length in Finnish (Vainio et al. 2011). We investigate whether syntactic information in a language with less restrictive word order (Russian) interacts with word length and morphological structure during parafoveal processing in silent reading as reflected in eye-movements.

Method

In Russian, the VNN word order has an equal chance of being either an OS or SO order (Kemp and McWhinney 1999). Morphological processing in the parafovea was examined using the boundary change paradigm (Rayner 1975) with three preview manipulations on the morpheme ending only of the target word: identical (no change), morphologically related (different inflectional ending), or nonword (inflection replaced with a consonant). Examples of the target and preview conditions are given in

constitutes parafoveal processing of morphology. Different preview effects on the subject vs. the object constitutes the influence of syntactic information on the extraction of morphology from the parafovea.

Results and Conclusion: Analysis of gaze duration revealed significant difference between identical and non-word conditions ($p < .05$) and a marginally significant ($p < .1$) interaction between

target position and parafoveal preview in morphologically related condition (faster than the non-word in object position only) (see Table 2).

These results are in line with findings from Hebrew

VSQ	Gaze
	Target
Identical	299 *
Related	293 ^
Non-word	320
VSQ	Gaze
	Target
Identical	296 *
Related	333 ^
Non-word	324

Table 2. Results

(Deutsch et al. 2003) and can be interpreted as evidence of parafoveal morphological processing in Russian during silent reading. Moreover, this is the first demonstration that syntactic position of the word modulates the extraction of morphological information parafoveally and suggests that preceding syntactic information can narrow down possible candidates and facilitate the preprocessing of the word $n+1$.

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NEURAL TIME-COURSE OF THE OBSERVATION OF HUMAN AND NON-HUMAN TOUCH

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Previous neuroimaging studies have demonstrated that the observation of the actions of others activates neural circuits that are involved in the execution of the same actions (Buccino et al., 2001; Lui et al., 2008). It has been suggested that the same mechanism applies to the sight of touch, which enables us to understand the sensations of others (Keysers et al., 2004). Consistent with this, recent functional magnetic resonance imaging studies reported activation of primary and secondary somatosensory cortices when participants experienced touch as well as when they observed another person or object being touched (Ebisch et al., 2008; Schaefer et al. 2010). However, little is known about the time-course of these neural activations or the extent to which they are specific to human touch.

In the current study, we used event-related potentials (ERPs) to examine the time-course of the neural mechanisms underlying the observation of human and non-human object touch. During touch

trials, participants were presented with short video clips of an arm or a non-human cylindric object being touched by an object. In non-touch trials, participants watched videos of an object moving in front of the arm or non-human cylinders without touching them. Before this ERP assessment, each participant's arm was touched with the same touching objects used in the ERP stimulus videos.

ERP component differences were observed in midline central electrodes between 500 and 700 ms after stimulus onset. Statistical analysis of the mean amplitude of this activity revealed a main effect of touch (touch versus non-touch) and a main effect of stimulus type (human versus non-human), but no interaction. The earlier occipital-temporal N170 component also exhibited a main effect of stimulus type, with larger amplitudes in response to the human versus non-human stimulus types. These findings suggest that the observation of human and non-human object touch are indexed, in a similar manner, at a relatively late cognitive stage of neural processing that follows the perceptual encoding of human versus non-human objects. Time-frequency analyses will be conducted and reported, in order to further examine the neural mechanisms underlying the observation of human and non-human touch.

THE EFFECT OF INTRANASAL SEROTONIN ON COGNITIVE DEFICIT AND ALTERED FUNCTIONAL ACTIVITY OF ADENYLYL CYCLASE SYSTEM IN NEONATAL DIABETES

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Diabetes mellitus (DM), one of the most severe metabolic disorders in humans, is associated with many neurodegenerative disorders (Stiles and Seaquist 2010).

According to our and the other authors' data, the alterations in the brain signaling systems regulated by serotonin and the other neurotransmitters contribute to triggering and development of neurodegenerative processes in DM. However, the activity of the brain adenylyl cyclase (AC) system and the cognitive functions in type 2 DM (T2DM), their interrelation, and the influence of intranasal serotonin (I-S) on the functioning of the brain in T2DM are poorly understood yet. In this work we investigated the influence of 8-weeks I-S treatment on the cognition and the hormone-sensitive AC system in the brain of rats with neonatal T2DM.

Neonatal DM was provoked by streptozotocin at the dose of 80 mg/kg of body weight in newborn 5-days rats (Blondel et al. 1989). Using glucose tolerance test we showed that 6-months old rats with neonatal DM have a pronounced insulin resistance typical of human T2DM. A daily intranasal delivery of serotonin to 6-months old healthy and diabetic rats at the dose of 20 µg/rat was carried out according to the method (Thorne and Frey 2001). The AC activity was measured as described previously (Shpakov et al. 2010) and expressed as pmol cAMP/min per mg of membrane protein. To measure the AC inhibitory effect of hormone, the enzyme was pre-activated by diterpene forskolin (10^{-5} M). The cognitive functions and the influence of I-S on the spatial memory and learning were studied using MWM test in two 5-days series of experiments, the first covered days 1–5 and the second days 35–39.

The learning process was estimated according to the duration and dynamics of the latent period for finding the hidden platform. In diabetic rats the latent period in the first series was 3.5 times and in the second series 4–4.5 times longer compared with the control, and the dynamics of time reduction in locating the platform was less pronounced.

I-S did not change the duration and dynamics of the latent period in control rats, but significantly improved the learning process in diabetic animals. On the 4th day of the first series the escape latency reached the plateau and the information about the location of platform was maintained throughout the experiment. In I-S-treated diabetic rats the latent period in both series was lower compared with untreated diabetic animals, and the difference was significant ($P < 0.05$). The maximal effect of I-S was 4 times, at most, the reduction of the latent period on the first day of the second series. In both series there was a significant difference in the trajectories of swimming to the remote platform in untreated diabetic and control animals. I-S did not influence the swimming tracking in control animals, but in I-S-treated diabetic rats the trajectories were much shorter compared with untreated diabetic animals and were similar to those in the control. On the last day of testing in the first and the second series there was no difference in the number of annulus crossings between untreated and I-S-treated control rats. In DM the number of annulus crossings was decreased, and I-S treatment significantly increased this parameter in both series. In the first and the second series the number of annulus crossings in IS-treated diabetic rats was, on average, 1.7 times higher compared with untreated diabetic animals. Paradoxically, in the second series the number of annulus crossings in IS-treated diabetic rats was higher than in both groups of healthy animals. This furnishes grounds to say that I-S improves the long-term spatial memory in rats with neonatal DM, making it similar to healthy animals. The decrease of time for search of the platform and the increase of the number of annulus crossings in IS-treated diabetic rats show serotonin-induced improvement of cognitive functions in diabetic rats.

The basal AC activity in the brain in neonatal DM did not differ significantly from control. Non-hydrolysable analog of GTP, GppNHp (10^{-5} M), activator of G_s proteins, stimulated AC activity in control and diabetic rats by 188 and 197%, and forskolin (10^{-5} M) acting directly on the catalytic site of the enzyme stimulated AC activity by 281 and 273%, respectively. The basal AC activity in the brain of IS-treated diabetic and control rats was a little lower than in the untreated animals. I-S did not influence the AC stimulating effects of GppNHp and forskolin. Norepinephrine, dopamine, serotonin and agonist of type 6

5-hydroxytryptamine receptor (5HT₆R) EMD-386088 stimulated AC in the brain of both diabetic and control animals. In the diabetic brain AC effect of norepinephrine was decreased, the corresponding effect of dopamine was on the contrary increased, and AC effects of 5-HT₆R agonists remained unchanged. I-S decreased AC stimulating effects of serotonin and EMD-386088, especially in diabetic rats. In DM I-S partially restored AC effect of dopamine and weakly influenced AC effect of norepinephrine. In the control the hormones acting via G_i-coupled receptors, such as norepinephrine, dopamine, serotonin, selective 5-HT_{1B}R agonist 5-nonyloxytryptamine, 5-HT_{1/2}R agonist 5-methoxy-N, N-dimethyltryptamine, and D₂-dopamine receptor agonist bromocriptine all decreased forskolin-stimulated AC activity, and in T2DM their AC effects were markedly decreased, especially in the case of serotonin and 5-HT₁R agonists. I-S treatment led to a significant restoration of AC inhibitory effects of these hormones. Thus, in the brain of rats with neonatal DM the activity of some AC signaling pathways regulated by the biogenic amines was changed, and I-S partially restored these alterations.

Summing up, in the brain of rats with neonatal model of T2DM the functional activity of AC system sensitive to the biogenic amines was subject to changes, the most significant alterations being observed in G_i-coupled cascades that mediated

the inhibition of AC activity, especially in 5-HT₁R signaling. These alterations were associated with cognitive deficit detected in diabetic animals, using MWM test, and manifested as impaired learning and spatial memory. I-S improves both the brain hormone-sensitive AC system and cognitive functions of diabetic rats, which, on the one hand, clearly demonstrates their interrelation, and on the other, opens up a new avenue to correct and prevent the alterations and disturbances in the brain signaling and to improve learning and memory impaired in T2DM.

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WHAT IMMANUEL KANT MIGHT HAVE THOUGHT ABOUT THE OUROBOROS MODEL

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The great philosopher of Kaliningrad (Königsberg at his time) Immanuel Kant had a clear conception of what is possible to experience and think:

“Die Bedingungen der Möglichkeit der Erfahrung von Gegenständen sind zugleich die Bedingungen der Möglichkeit der Gegenstände dieser Erfahrung”

“The conditions of the possibilities to experience objects are at the same time the conditions for the possible objects of this experience”

This statement pertaining to the first of Kant's three fundamental questions (“*Was kann ich wissen*”, “*What I can know*”) offers a good

entry point for highlighting parallels between his tenets and what is hypothesized according to the Ouroboros Model.

Action and Memory Structure

The Ouroboros Model stands for a comprehensive biologically inspired cognitive architecture (Thomsen 2010). It holds that memory entries are organized into hierarchies of schemata, i.e. meaningful junks of features and concepts belonging together. Neural assemblies are permanently linked together when once co-activated in the right manner. Later activation of a feature promotes the selected concept and leads to graded activation for each of the associated constituents, which are usually active in the same context. Activation at a time of part of a schema biases the whole structure with all relevant slots and, in particular, missing features.

Principal Algorithmic Backbone

At the core of the Ouroboros Model lies a self-referential recursive process with alternating phases of data acquisition and evaluation. A monitor process termed ‘consumption analysis’ is checking how well expectations triggered a one point in time fit with successive activations; these principal stages are identified:

- ... anticipation,
- action / perception,
- evaluation,
- anticipation,...

These steps are chained into a full repeating circle, and the activity continues at its former end, like the alchemists’ tail-devouring serpent called the Ouroboros.

Consumption Analysis

Any occurring activation excites associated schemata. The one with the highest activation is selected first, and other, possibly also applicable, schemata are inhibited, suppressed. Taking the first selected schema and ensuing anticipations active at that time as reference and basis, consumption analysis checks how successive activations fit into this activated frame structure, i.e. how well lower level input data are “consumed” by the chosen schema. Mismatches between anticipations based on previous experience and actual current data are highlighted and used for controlling the allocation of attention. At the same time monitoring the quality of congruence with experience provides a very useful feedback signal for any actor under almost all circumstances. It is hypothesized that the “feeling”, i.e. affective, component of emotions is primarily that: a feedback signal from the consumption analysis process to the actor. Progress can be as expected, better (feeling good) or worse (feeling bad) (Thomsen 2011a).

Space and Time, the Apriori, which formed the basis for Kant, are acknowledged as fundamental constituents of many schemata, they are not derived from the experience; – over the lifetime of any individual one should add, but rather as a product of selection of the useful over generations, i.e. evolutionary Aposteriori (Riedl 1983).

The potential mental processing power of an agent according to the Ouroboros Model is ground-laid in the number, complexity and elaboration of the concepts at her disposition. Schemata, their number of slots, the level of detail, the depth of hierarchies, degree of connection and interdependence of the building blocks, and the width, i.e. the extent of main schemata and their total coverage from the bodily grounding level to the most abstract summits, determine what can be perceived and thought of

efficiently. Adequacy, coherence and consistency are crucial, with the first one actually based on and derived from the latter two. Sheer performance at a single point in time is possible as a result of the optimum interplay between these structured data and the effective execution of all the described processing steps.

Moving over to Kant’s second question (“*Was soll ich tun*”, “*What ought I to do*”) and his answer, the categorical imperative, in the light of the Ouroboros Model this is nothing else but a general consistency condition, with no particular preferred individual.

In times when no more guidance from an authoritative and undisputed external deity can be resorted to, it is, again, consistency in a wide sense, which remains as guideline. All-encompassing concepts can only be ranked according to their breath and depth, level of detail, applicability and effectiveness, usefulness. It is argued that thus the same bootstrapping applies to the “last questions” as what has been found for the distillation of apriori and, in principle, all other schemata. With the addition that one may hope mankind can agree on some level of mutual respect (a condition of weak consistency), this is the best answer, dissatisfactory as it may be to some, that the Ouroboros Model has to offer to Kant’s third question (“*Was darf ich hoffen*”, “*What may I hope*”).

The Ouroboros Model offers a novel self-consistent and self-contained account of efficient self-referential and self-reflective data processing in autonomous agents. A certain problem for exposing the somewhat involved concepts and their interdependencies lies in the principal cyclic nature of the depicted processes. Seemingly circular connections and arguments are easily avoided by carefully observing the direction of time: any processing step relies only on data and structures available from before but it works “backwards” in the sense that it has the power to influence these very items leading to changes, which then become effective for the same process but only afterwards during subsequent process cycles.

It has been claimed this principal set-up can shed light on a vast variety of questions ranging from basic psychological effects like attentional blink to the emergence and provoking of consciousness (Thomsen 2011b). Actually, this very fact, that widely separated questions can be tackled with just one approach is taken as one of the main arguments for the proposed structures and processes. In the light of the Ouroboros Model, prominent brain structures as well as diverse claimed best ingredients for building general artificial intelligence turn out to

be just different facets and consequences of the total overall set-up of efficient minds.

The touchstone for the Ouroboros Model in the end will be its confrontation with reality, i.e. how well actual implementations work in interesting applications for robots and software agents. An attempt to substantiate some of the claims together with an invitation for collaborations will be in the focus of the reported work.

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EVOLUTIONARY ONSET OF THE FUTURE TENSE: COGNITIVE-ANTHROPOLOGICAL VIEW IN TERMS OF CONCEPT OF DEATH AND AFTERLIFE

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Tense and aspect have been studied from various angles, but its evolutionary onset is rather overlooked. Among different types of tense, it is easier to identify a source of the past and non-past tense (cf. Bybee et al. 1994; Heine and Kuteva 2007; Toyota 2008, etc.), but it is rather difficult to trace an origin of the future tense. In this paper, it is argued that an evolutionary onset of the future tense can be possibly traced back to the cognitive and anthropological factors concerning the concept of death and afterlife. Thus, like other studies on evolutionary onsets of different grammatical structures, non-linguistic factors are crucial in explaining the development of this tense.

A common source of the future tense follows a common grammaticalisation path from a couple of lexical verbs, e.g. verb of desire/wish and motion verbs, as well as a distinction in modality between realis and irrealis, often reported as future and non-future tense. Other odd sources include possession, adverbs, deixis, etc. (Heine and Kuteva 2002; Nordlinger and Sadler 2004, Muysken 2008). Whatever grammaticalisation path a language has taken, there is a clear distributional pattern of the future tense in the world, as represented in Figure 1. Dark dots represent languages with the overt marking for the future tense, and white dots, the lack of future tense. From this map, it is clear that languages spoken in East and South-East Asia lack the future tense. This suggests that there should be something to trigger the onset of grammaticalisation. Apart from the normal grammaticalisation, future tense is likely to be replicated through language contacts (cf. Heine and Kuteva 2005) and what is

required is an intense contact with languages that have future tense. In spite of these two possibilities, languages in Asia have not developed the future tense. A question is raised here as to why these Asian languages have resisted influence various influences that could possibly develop a marking for the future tense.

It is argued in this paper that what makes the distribution of future tense is related to people's world view concerning death and afterlife. Those cultures with a firm idea of reincarnation (e.g. Tibetan Buddhism) seem to be aware of what happens after death. In others, death is the end of this life (e.g. Christianity) and no one knows for sure what awaits them. When the future is unknown or uncertain, this temporal domain belongs to the irrealis modality, and uncertainty naturally raises fear among people. Those areas where the future tense is missing (cf. Dahl and Velupillai 2008) represent people's worldview or beliefs that do not assume reincarnation, i.e. people have fear concerning afterlife. It is reasonable to assume that the presence of fear can be a trigger element to initiate the grammaticalisation process. In addition, the lack of fear seems to resist the influence from language contacts. Thus, fear seems to be a crucial factor concerning the creation of the future tense.

The development of the future tense is complex and it involves various elements of human culture and linguistics alone may not be able to account for its evolutionary onset.

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COMPARISON OF EMOTIONAL RATINGS OF THE INTERNATIONAL AFFECTIVE PICTURE SYSTEM ACROSS ISRAELI AND RUSSIAN SUBJECTS

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It is already shown that emotional experience both universal and culturally specific. At last twenty years increasing number of researches focused on cross-cultural features of emotional reactions (Suh et al., 1998; Kitayama et al., 2000; Mesquita, 2001). Nevertheless the question whether cultural values shape human emotions remains unanswered.

The main aim of this work was to compare emotional responses to the international affective picture system (Lang, Bradley & Cuthbert, 1999) in two different cultural groups.

First group included 14 Russian-speaking students from Saint-Petersburg State University, aged between 21 and 29 years (mean age=23,1 yr). Second group was formed from 12 Israeli students of Ariel University Center. These subjects were specifically selected in accordance with the following criteria: a) born in Israel; b) have Israeli parents; c) fluent in Hebrew. Mean age was 24 years ranging from 20 to 29 years. Participants took part for partial fulfillment of course requirements.

After providing informed consent according to the Declaration of Helsinki (DoH, 1964), participants were asked to view affectively emotional and neutral pictures on a computer monitor. Presentation of stimuli was carried out using SuperLab Pro software. The experimental design was established on the basis of normative

rating procedure of IAPS (Lang, Bradley, & Cuthbert, 1999). Subjects had to rate pictures on the dimensions of affective valence (pleasant vs. unpleasant), arousal (calm vs. excited) and dominance (vs. control). Ratings were performed using a pencil-and-paper version of the Self-Assessment Manikin 9-point rating system in which "1" – the most negative/boring/dominant, "9" – the most positive/exciting/in control. To clarify the rating system and possible variants of stimuli participants were presented with the training sequence which consisted of three pictures of different emotional content.

Pseudo-random sequence was created as a set of 60 images balanced with respect to the valence and content of stimuli. Emotionally-negative stimuli were alternated with emotionally-positive clips with the purpose of negative effect accumulation removing. Each picture lasted for 6 seconds. The evaluation time was 15 seconds.

Self-reported answers of Russian and Israeli students for SAM scales are displayed in table 1. The number of pictures rated as negative with valence < 5.00 was larger in group of Israeli students (n=34) than in Russian (n=28). This prevalence occurred because of Russian participants who reported their emotions more calm while viewing both positive and negative pictures. It is also important to note that the differences in the intensity of those ratings across 2 cultures were strongly pronounced as well. As can be seen from table 1 the range of estimates in Russian group varies from 1.93 to 7.43 points and does not reach the extreme values of the scale. Meanwhile the analyzed range in Israeli students

	Dimensions					
	Valence		Arousal		Dominance	
Students	Russian	Israeli	Russian	Israeli	Russian	Israeli
Ranges	1.93–7.43	1.33–8.58	3.00–5.93	2.25–7.58	1.57–4.93	1.75–7.50
Mean	4.79	4.55	4.19	5.16	3.20	4.26
SD	1.83	2.55	0.67	1.28	0.82	1.58

Table 1. Ranges, means and standard deviations (SD) of self-report for 60 stimuli selected from the IAPS (Russian and Israeli subjects).

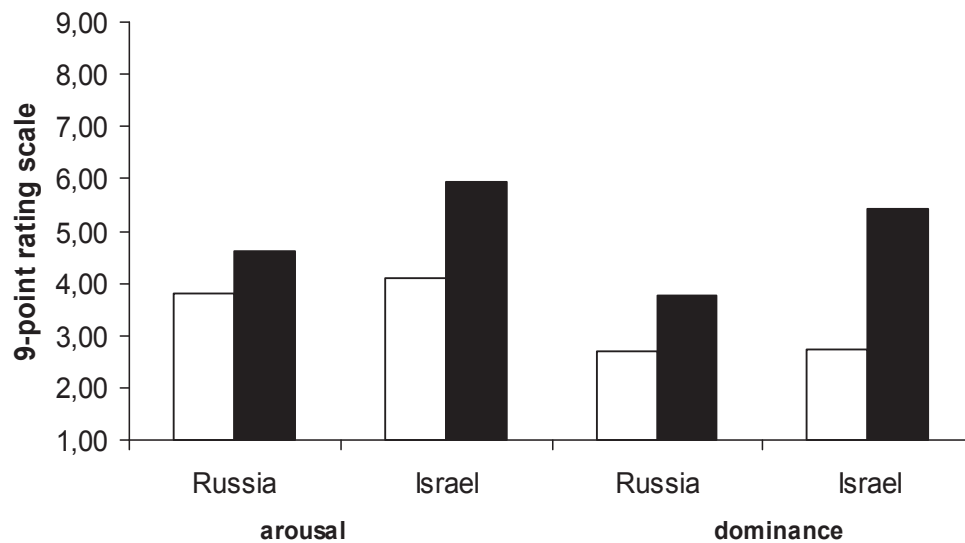


Figure 1. Mean Russian and Israeli students' ratings for the dimensions of arousal and dominance in response to positive (white bars) and negative pictures (black bars).

is much wider and covers the border points of the scale such as 1.33 and 8.58 points.

The two groups differed on the arousal scale as well. Israeli students were more excited while watching the IAPS materials. The mean range of subjective emotion ratings was on over 20% higher than Russian students. Similarly, Israeli participants reported emotions significantly more in control (up to a maximum of 7.50 points) compared Russian subjects. Maximum value of Russian subjects ratings reaches only the middle of the SAM scale (4.93).

Following the analyses of the SAM measures of the arousal and dominance scales across all pictures irrespectively the valence, the data were considered separately for positive and negative stimuli (see Figure 1). The results revealed that the most remarkable differences between the two cultural groups are in the emotional response to the negatively valenced pictures. Both arousal (5.96) and dominance (5.41) estimates during watching negative stimuli in the group of Israeli students were significantly larger than in Russian subjects (4.61 and 3.78 respectively). However the groups did not differ significantly in the emotional responses to positive stimuli.

Generally, Israeli participants demonstrated high intensity of the emotional ratings, especially, negative compared to subjects from Russian. Modern Israel society emphasizes predominantly Western family values like liberality and individualism (Mikulincer et al. 1993; Cohen, 2007). Meanwhile Russian even nowadays accepts some values of collectivism. The results of current research confirmed the theory of differences in emotional experience in collectivistic

and individualistic cultures. It was shown (Matsumoto, 1992) that people in individualistic cultures tolerate to negative emotions in public as a part of independency and self-assertiveness. In contrast, collectivistic societies avoid recognizing negative emotions in order to maintain social rules and group harmony.

The results can be considered as an evidence of the link between self-report of emotional experience and the manner in which people identify themselves in the society: as members of a group (collectivism) or as individuals (individualism).

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LATERALIZATION OF A SOUND IMAGE IN THE AREA OF THE BEST AUDITORY SPACE RESOLUTION IN HUMANS

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There are two main factors of localization of sound sources in the horizontal plane – interaural time (ITD) and intensity (IID) differences of stimulation. When a sound source is near of the head midline of a subject, ITD and IID are equal to zero. When the sound source shifts to the left or to the right from the head midline, ITD and IID values differ from zero. The method of dichotic stimulation through headphones is one of the best methods for investigation of the process of localization. This method is used for modeling of a sound source position in space to control precisely parameters of localization (lateralization). In the course of numerous investigations, main characteristics of lateralization of a stationary fused auditory image (FAI) were described (Altman et al. 1999, Varyagina, Radionova 1998). Particularly, differential thresholds for ITD and IID have been identified (Domnitz, Kolburn 1977, ShakhshaeV 1981). Minimal thresholds have been observed near the head midline and, therefore, this area of acoustic space has been defined as the area of the best auditory space resolution. The present work is devoted to more detailed investigation of FAI lateralization in this area.

The work was performed on 25 subjects with normal hearing. Sound signals were binaurally presented click trains which produced a sensation of stationary FAIs. For dichotic acoustical stimulation, two dynamic earphones were used. Each experiment began with threshold measurements at the right and left ear of the subjects. During the experiment, the subjects were instructed to listen attentively to the sounds (click trains) and to show with a finger the point on the head surface where the FAI was perceived. 3 variants of IID values were imposed: IID= -1.7 dB, $\Delta I=0$ dB, $\Delta I=1.7$ dB. ITD value was equal to zero during all the experiment. In order to assess the position of the FAI, we fixed a centimeter band on the subject's head with its zero mark on the midline. The distance from the FAI position to the midline was measured in centimeters and recalculated in degrees under the assumption that the ear to ear arc length is equal to 180°. We estimated the FAI position (in degrees) at different IID values and plotted it as a function of IID.

Two main subject groups were defined: 1) 15 subjects with asymmetrical hearing (values of the

thresholds at the right and left ear were different, i.e. the left or the right ear was leading); 2) 10 subjects with symmetrical hearing (they had no differences between the threshold values at the right and left ear).

19 subjects perceived FAI positions at the crown of the head, 6 subjects – at the back of the head. 10 subjects detected all the FAIs only to the right from the head midline (in the right subjective acoustic space).

It was established that with IID change within ± 1.7 dB, the FAI positions shifted toward the ear receiving the more intense stimulus. Functions relating the value of the perceived FAI positions (Y) on IID value (X) were nearly linear: $Y=AX+B$. In this equation, B (in degrees) represents the perceived lateral FAI position when IID=0 (the intercept). Coefficient A (deg/dB) represents the rate at which the perceived lateral position changes with IID (the slope of the function) and reflects the effectiveness of the IID factor in lateralization.

It was found that all the subjects successfully perceive all the lateral FAI positions (at IID= -1.7 dB, IID=0 dB, IID=1.7 dB) near the head midline. However, certain differences were found between the groups of the subjects. For example, the subjects with symmetrical hearing had difficulties in lateralization of right-sided FAI positions (IID=1.7 dB). Also the subjects with the right ear leading had difficulties in lateralization of left-sided FAI positions (IID= -1.7 dB).

The analysis of the FAI positions at IID=0 (B value from the equation $Y=AX+B$, in deg) can be an evidence of right-sided mechanisms of lateralization as compared to left-sided ones: at IID=0, the FAI positions were shifted to the right from the midline (especially, in the subjects who perceived all the FAIs only in the right subjective acoustic space). This fact is in accordance with our previous researches (Altman et al. 1999, Varyagina, Radionova 1998).

The analysis of A values (in deg/dB) from the equation $Y=AX+B$ (the effectiveness of the IID factor of lateralization) did not show differences between A values at the right and left subjective acoustic space in all the subjects. Moreover, the subjects who detected all the FAIs only in the right subjective acoustic space revealed low A values at the right subjective acoustic space in comparison with the subjects who perceived FAIs as well in the left as in the right subjective acoustic space. However, in the above mentioned works (Altman et al. 1999, Varyagina, Radionova 1998), the slope

coefficient A was higher on the right than on the left from the midline. These differences between the present work and earlier investigations, perhaps, are because of methodical peculiarities of the experiments (for instance, in our present research we used a narrow IID diapason).

Thus, all the peculiarities of FAI lateralization obtained can illustrate the importance of presence or absence of the threshold differences at the right and left ear (symmetrical or asymmetrical hearing, the left or right ear leading) and the structure of subjective acoustic space for a sharp detection of stationary FAIs at the head midline, i.e. in the area of the best auditory space resolution.

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DO DIFFERENT METAMEMORY JUDGMENTS SHARE THE SAME UNDERLYING COGNITIVE PROCESSES?

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When we learn new material, we generally monitor our learning of that material, before, during and after learning, and regulate the allocation of learning resources accordingly. Several such metamemory judgments exist in the literature, like for example, Ease of learning (EOL) judgments (Underwood, 1966) and Judgments of learning (JOL; Nelson & Dunlosky, 1991). EOL judgments are judgments which are made before the to-be-learned items are studied and refer to the subject's estimates of his or her difficulty of learning each item. JOLs are metamemory judgments made when knowledge is acquired. In the literature a distinction is made between delayed JOLs and immediate JOLs. Whereas immediate JOLs are made directly after the end of learning a particular item, delayed JOLs are instead made after a delay. It has been argued that delayed JOLs are primarily based on a retrieval attempt from long-term memory, whereas immediate JOLs are to a larger extent based on item characteristics like, for example, how related two words in a word pair are (if word pairs are studied) or the familiarity or concreteness of the items (Nelson & Dunlosky, 1991; Sikström & Jönsson, 2005).

The present experiment aimed to investigate to what extent different metamemory judgments are based on the same underlying cognitive processes. We let forty students divided into two groups

(Group: speeded vs. unspeeded judgments) make EOL judgments on 40 Ukrainian-Swedish word pairs. Following that, they studied and made an immediate JOL on each word pair, which was then followed by delayed JOLs. Finally, after a filler activity, they tested their memory in the form of a cued recall test.

If the different metamemory judgments are based on the same underlying processes they should be very highly correlated with each other. The inter-correlations between the three judgments ranged from .39 to .44 for the speeded group, and .57 to .68 for the unspeeded group. This indicates that at least in part the judgments seem to be based on the common sources. Of key importance is that the delayed JOLs were as highly correlated with the EOLs, as the immediate JOLs. This is surprising as EOLs are assumed to primarily be based on intrinsic cues, similarly to immediate JOLs, whereas delayed JOLs are supposedly based on diagnostic retrieval attempts.

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TWO-DIMENSIONAL VISUALIZATION OF THE ROOTS OF GERMAN LANGUAGE DERIVING NOUNS AND VERBS

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Words of any language can be ordered in a list with gradually decreasing frequency of occurrence in texts. The similar lists can be compiled for the elements of words – roots and affixes. It turns out that the functional dependence (frequency vs rank) is quite different for words and roots. Words obey Zipf law, while roots follow exponential dependence (Vvedensky 2010). One finds 14000 words with German word roots in the list of 30000 most frequently used words which use about 1700 word roots or about one root per 8 words. Our goal is to study the properties of words of human language with the help of the experimental techniques, so we

would like to analyze the “most important” words. Nouns and verbs are two most basic lexical elements of speech. It turns out that only about one third of the most often used German roots can generate both nouns and verbs. We consider these 675 roots as the “core” of the thesaurus. One can calculate two frequencies of occurrence, one corresponding to the use of the root in nouns and another for verbs. This results in two-dimensional plot presented in Fig.1. We see that these roots cover a certain area on the plane in a reasonably homogenous manner. All the other roots can probably be arranged in the similar manner below and to the left of the displayed set of points, since their frequencies of occurrence as noun or verb are small or zero.

The logarithmic scale of this figure allows more detailed match of linguistic and neurophysiological

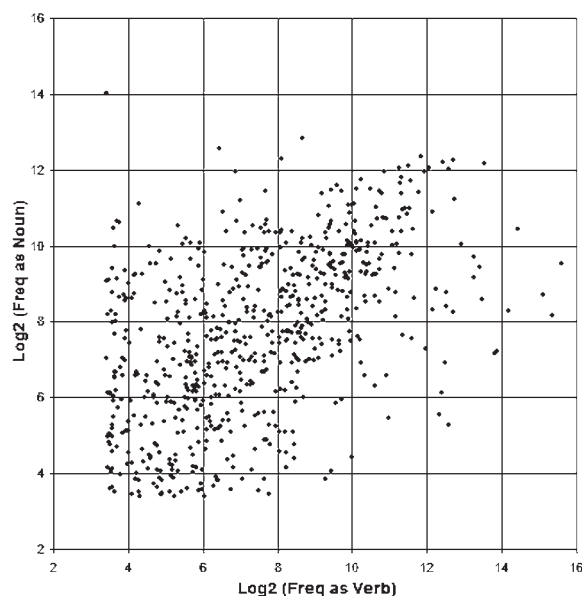


Fig.1. Distribution of 675 German word roots, which derive both nouns and verbs. The units are binary logarithms of the frequency of occurrence. The horizontal scale for verbs and the vertical scale for nouns. The frequency is calculated for one million of root occurrences. The total analyzed frequency list contains 1766 roots, most of which lie out of the area shown in this plot, since they are less frequent then 6 per million, either for nouns or for verbs. The cutoff edges are visible.

data. A certain firing neuron can evoke activity of another neural cell sending an electric impulse to several neurons in the neighborhood. The impulse travels through axon, which forms numerous branches in the vicinity of the firing neuron or at a certain distance, may be in the other hemisphere. The branching pattern is limited in space displaying nearly exponential decay in the area of about 1–2 mm on the cortical surface (Ojima et al 1991, Carmichael and Chesselet 2002). If there exists a pool of neurons firing when the speech has to be uttered, it will send spikes (neural impulses) to another area in such a way, that the parts lying closer to the firing area will be activated exponentially more often then the distant parts. If this target area stores the “images” of what should be uttered, the elements (roots) will appear in speech with frequencies showing exponential dependence. The distribution of “images” over the “storage area” takes shape in childhood and most frequently used roots will first fill the most favorable positions.

In addition to the pool of neurons which is firing to just support speech one can imagine similar pools which become active when something conveying specific sense should be mentioned just that time. This can be an object in the form of noun or an action in the form of verb. If so, these “verb or noun

activators” should be located on different sides of the distribution shown in Fig.1. The areas, which can be reached by these “activators”, are limited and do not cover completely the whole area of roots. Hence many roots can not be used to form either nouns or verbs. During language acquisition the roots occupy positions in this area in accordance with preferred use of each root to form verb or noun.

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FROM MEANING TO CONTENT: DYNAMICS OF CONTEXTUALIZATION

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This paper will explore in a theoretical manner the semantics of text content. Text content as a level of meaning needs to be distinguished as different in kind from (a) the meaning of lexical items and

(b) the meaning of linguistic expressions, such as sentences or clauses, where the latter are taken in isolation from their context.

Whereas it might be thought that propositions, as familiar constructs in philosophy, constitute meaning-type (b), and by extension also the meanings of whole texts (cf. van Dijk and Kintsch 1983), the present paper takes a skeptical position on the possibility of the proposition being an intelligible unit of linguistic meaning.

The notion of proposition in the history of philosophy presents numerous problems: Does it include reference or not? Is it somehow defined by truth conditions? Is it subjective in character or is it invariant from one subject to another (i.e. is it an interpretation or not)? Is it tensed and are time relations part of it? Is it in fact a meaning at all? If it is a meaning, how is it that we sometimes still encounter the idea of 'the meaning of a proposition' among philosophers, not to mention those cases where the terms *proposition* and *statement* are used as if they were interchangeable, e.g. Whitehead (1941: 297–299)? Hence the present paper will substitute for the proposition a particular notion of cognitive modeling.

In any transition from meaning-type (a) to (b), the latter is still distinct from fully contextualized meaning, which we may call meaning-type (c), but it is possible to specify how (b) is transformed into (c) provided that (b) is defined in the appropriately cognitive manner. I will characterize this as the transition from an indeterminate situation model to a determinate situation model.

Each of these transitions reflects a level of contextualization. However, the transition to a fully determinate situation model, occurring within a context of use, brings with it a range of other sorts of content, namely: reference; spatiotemporal location; communicative attitude. These will be briefly discussed as features of contextualized meaning, but the main focus of the discussion will remain on situation models. (Note: In the classic text processing theory of van Dijk and Kintsch situation models were introduced *alongside* macro- and micro-level propositions. Having dispensed with propositions, I present a notion of situation model that is nevertheless considerably indebted to those authors. But I avoid the residual logicism of their approach.)

The three levels of meaning (a-c) can be seen to correspond respectively with the notions of motif, profile and theme introduced by Visetti and Cadiot 2002 and Visetti 2004. The *motif* corresponds to lexical-semantic meaning, which is invariably polysemous to a degree; the *profile* emerges with the incorporation of a lexical item into a linguistic

expression, such as a sentence, which may then afford access to a *theme* within a text or body of discourse. Thus profiling and thematization are processes that constitute two levels of contextualization.

Profiling is a transition from the open-endedness of the lexicon to delimited meanings within a context of discourse, the process in which motifs are deployed to themes. As these authors point out, such a process cannot be reduced to simple 'instantiation'; there is nothing in the notion of instantiation that can explain how themes can emerge from a polysemous lexicon. In the notion of profiling we have the beginnings of such an explanation.

The mediating semantic form that enables this transition from lexical meaning to content I call a situation model. From the very first insertion of a lexical item into an authentic linguistic expression, whereby a situation model is formed, the profiling of the item begins – that is, its inherent polysemy is resolved to a more particular meaning – and on this basis thematization within the discourse can proceed. This is the formation of content as such.

One of the great tests of any theory of meaning will always be whether it can be equally applicable to a range of genres including literature. Speech act theory, for example, tends to fail that test. I will show briefly how my model is applied to the case of fiction and especially to character. For example a category such as *English* will tend to have a complex and variegated profile in the mind of a reader. If a character in a novel is presented as English, then the profiling that occurs around this character will be such that many aspects of the motif are suppressed and others accentuated. One of the ways in which this is done is through the milieu (x) from which the character emerges, e.g. urban punk rockers as opposed to conservative landed gentry. The presented milieu suppresses many potential meanings of the term *English* while foregrounding others. In such ways, via milieu, plot, etc., a concept like that of Englishness can enter the thematic content of a specific fictional text. It is not merely 'instantiated'.

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THE CONTRIBUTION OF RUSSIAN SCHOLARS TO THE INTERDISCIPLINARY COGNITIVE RESEARCH

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The present paper attempts to shed some light on the contribution of Russian cognitive scholars to the world interdisciplinary cognitive research.

1. While traditional forms of knowledge production referred to as mode-1 knowledge are disciplinary, homogenous, hierarchical and dictated by the interests of academic communities, the new production of knowledge, or mode-2 knowledge, is transdisciplinary (generated in context of application, possessing its own distinct theoretical structures, methods and modes of practice, which may not be locatable on the conventional disciplinary map), heterogeneous (bringing together multiple skills and experiences, involving multiple sites of knowledge production and differentiating at those sites), and heterarchical (changing, not following a predefined system of knowledge organization) (Fox, 2009; cf. Nowotny et al., 2004; Gibbson et al., 2005; Polimeni, 2006; Pohl, 2008).

2. Lev Vygotsky's theory of concept formation laid the ground for the development of cognitive-pragmatic paradigm in Modern Russian Linguistics. According to him it is a functional use of the word, or any other sign, as means of focusing one's attention, selecting distinctive features and analyzing and synthesizing them, that plays a central role in concept formation. L. Vygotsky's idea of *inner speech* laid the basis for the modern theories of the Mental Lexicon. Originally inner speech was understood as word memory. According to L. Vygotsky word memory is only one of the constituent elements of inner speech, but not all of it. Verbal thought appears as a complex, dynamic entity, and the relation of thought and word within it as a movement through a series of planes. The transition from inner speech to external speech is not a simple translation from one language to another. It is a complex, dynamic process involving transformation of the predicative, idiomatic structure of inner speech into syntactically articulated speech intelligible to others. The development of verbal thought takes the following course: from the motive that engenders a thought to the shaping of the thought, first in inner speech, then in meanings of words, and finally in words (Выготский 1934, Vygotsky 1986: 248–249).

3. Modern Cognitive Anthropology builds on the ideas of cultural-historical psychology by L. Vygotsky, A. Leontyev, A. Luria.

4. The communicative aspect of cognition was introduced by M. Bakhtin in his theory of dialogism which laid the ground for the studies of social cognition (Croft 2009) and situated cognition. Lev Jakubinsky and Evgeny Polyvanov contributed to the cognitive aspects of dialogism by emphasizing that shared apperception by communicating parties is a necessary precondition of normal dialogue.

5. The theory of usage-based sense development by Alexandr Potebnya was a predecessor of modern invited inferencing theory of semantic change introduced by E.C. Traugott and R.B. Dasher (Traugott 2002), postulating that the speaker by using the word in a novel/ non-typical context as if invites the hearer to infer the new nuances of meaning (individual invited inference). At a later stage the individual becomes generalized invited inference (shared by more than one member of the speaking community) and then gets semantized into a new coded meaning of a word with its own conceptual structure.

6. Present-day Russian Cognitive Linguistics is represented by several theoretical schools. The main emphasis is on the conceptual analysis of linguistic expressions. Several trends of conceptual analysis can be distinguished:

a) Cognitive-discursive paradigm by E. Kubyakova. The school builds on the best traditions of L. Vygotsky and onomaseological approach to the analysis of meaning. It also treats the word as a unit of both cognition and communication. It postulates that the meaning of a linguistic unit is constructed on -line as the discourse unfolds and each time a particular frame of the word's meaning is activated by the discourse;

b) Cultural semiotic school by Y. Stepanov. Within the school a concept is understood as a Gestalt – as a clot of cultural environment in human cognition (Степанов 1997);

c) Logical analysis of languages (N. Arutyunova). Within the framework of the school special methodology of reconstruction of a concept was developed. The school aims at reconstruction of conceptual world views in the context of various cultures, psychologies and religions (Арутюнова 2003).

7. For the past few years intense research has taken place in the following fields of Russian interdisciplinary cognitive studies:

a. Moscow school of Cognitive Semantics (A. Kibrick, E. Rakhilina).

b. Neurosciences (T. Chernigovskaya, K. Anokhin).

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WORD ORDER IN AUTISTIC CHILDREN SPEECH

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Background: Autism is a developmental disorder whose behavioral characteristics range on a continuum from mild to severe. It is characterized by impairment in the development of reciprocal social and communication skills, abnormal language development. Certain characteristics of autistic children language have been described. It is proposed that some research in their language, particularly those related to word order, may show a specific deviance too.

Present research is an assessment of sentence order in autistic children who speak Persian base on language typology perspective.

Method: Participants of this study were 10 autistic children (f & m) ranging age from 6 to 12 years old range. Video recorded samples of 285 minutes patient-researcher interaction was used through spontaneous speech and picture naming test.

Result: Analyzing their produced utterances indicated some word order deficits in their speech. Major deficits include word order disorders in copula Sentences, Noun phrase (head and complements),

Preposition Phrase, Adjective Phrase and NG word order.

Conclusions: It is concluded that the hypothesis of deviance of language in autistic children, particularly in sentence word order, has approved by the results.

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GLOBAL CRISIS AND ITS CONCEPTUAL METAPHORS

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It takes a while for a concept to develop and ripen. But are there emergency situations when a concept becomes recognized almost immediately. Is this true for the concept of global crisis?

Global Financial Crisis of the late-2000s is thought to be the worst financial crisis since the Great Depression of the 1930s (Press Release 2009). Countries and governments, international companies, banks, persons suffered from the global financial crisis. It resulted in the collapse of large financial institutions, and downturns in stock markets around the world; the public sector had also suffered resulting in numerous evictions, prolonged unemployment, unpaid loans.

Everyone tried and is still trying to think over the problem, the ways to its solution, the consequences and how to minimize them. Global financial crisis was a shock for all members of society but common problems, common fears and expectations united people. Can global crisis be now viewed as the concept? Are there grounds for that? What is its structure? These are a few questions to be considered in the presentation.

The main interest of the presentation is focused on how the global crisis is represented in terms of conceptual metaphor. The analysis is based on the Conceptual Metaphor theory presented by Johnson & Lakoff in the work "Metaphors we live by" (Johnson & Lakoff 1980). The theory acquired recognition and wide application (among others see: Gibbs 1994, Kövecses 2002, Kövecses 2005, Evans and Green 2006).

Metaphors link two conceptual domains, the 'source' domain and the 'target' domain. The source domain consists of a set of literal entities, attributes, processes and relationships, linked semantically and apparently stored together in the mind. The 'target' domain tends to be abstract, and takes its structure from the source domain, through the metaphorical link, or

'conceptual metaphor'. Target domains are therefore believed to have relationships between entities, attributes and processes which mirror those found in the source domain. Conceptual Metaphor Theory argue that few or even no abstract notions can be talked about without metaphor: there is no direct way of perceiving them and we can only understand them through the filter of directly experienced, concrete notions (Deignan 2006). The fundamental tenet of Conceptual Metaphor Theory is that metaphor operates at the level of thinking. Language in use, is merely the surface manifestation of more important phenomena.

In the presentation the metaphors which conceptualize the global crisis will be identified, compared and discussed according to the following criteria: (1) geographical – Russian and American economies are analyzed; (2) diachronical – though short, the span of 5 years. The material for the research is taken both from Russian and American newspapers, tabloids and quality press, covering the period from 2008 to 2011. Having discussed the ways of global crisis conceptualization and means of its representation in the languages, we will possibly find out how people from different countries view the common global process, and how, if any, these views change with the time.

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THE ESSENCE OF BEING ALIVE IS HAVING THE FREEDOM TO CHOOSE ONES ‘COMPLIANCE’: A HUMANOID PERSPECTIVE TO UNDERSTAND ‘TOOL USE’ IN HUMANS

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We present experimental results and insights we have gained by trying to teach at the humanoid robot iCub to use a tool, i.e. steering a toy crane bimanually to pick up otherwise unreachable objects with its magnetized tip (fig. 1). The climax of the story is a thought experiment as to what would happen if the lifeless ‘toy crane’ is replaced by a human being, and the implications that follow. Computationally speaking, the action learning/generation architecture is based on the theory of impedance control (Hogan 1987) and on the Passive Motion Paradigm framework (PMP, Mussa Ivaldi et al. 1988, Mohan et al. 2009). Fig. 1, shows the PMP network for goal directed bimanual coordination of the toy crane. It represents the standard structure with the integration of the tool to be controlled. Key parameters are A_j that denotes the admittance in the arm joint space. Actively modulating it, it is possible to change the degree of participation of different joints to the overall movement (Morasso et al. 2010) and A_T that denotes the admittance of the tool. Note that A_T is an intrinsic property of the tool itself and cannot be ‘directly’ controlled during coordination (though we can fix it while designing the tool). The tool Jacobian J_T at the interface of the tool and the body is a central site for learning and

maps the geometric relation between motion of the end effector and corresponding motion at the tool effector (magnetized tip). J_T can be learnt through a combination of observing a teacher using a tool and practicing with the tool which basically generates data for learning i.e. position of the tool tip through vision and corresponding position of the two hands through proprioception (Mohan et al. 2011a). Further, an important feature to note in fig. 1 is that the entire ‘Tool+Body’ network operates through ‘well posed’ computations. For example, from the joint velocities it is possible to uniquely determine the end effector position, while the inverse results in infinite solutions. Similarly, there can be infinite combinations for forces exerted by the two hands to position the tool at a particular position (see fig. 2), but the transformation in opposite direction is well posed i.e. given the force exerted by the two hands on the tool, it is possible to uniquely determine the position of the tool tip. The goal is defined in terms of the tool angle ρ , i.e. the angle between the y-axis and the line joining the tool tip to origin (the goal could be equivalently defined in Cartesian space also). Intuitively, the relaxation of the ‘body+tool’ network to equilibrium on the activation of a goal is similar to coordination of the movement of a puppet by a puppeteer. As a consequence of the pull of the goal, the end effectors are simultaneously attracted to the position that allows the tool angle to track the evolving attractor. As a result, the joints in the upper body are concurrently pulled to values that allow the end effectors to reach the position that allows the tool tip to reach the goal. In this sense,

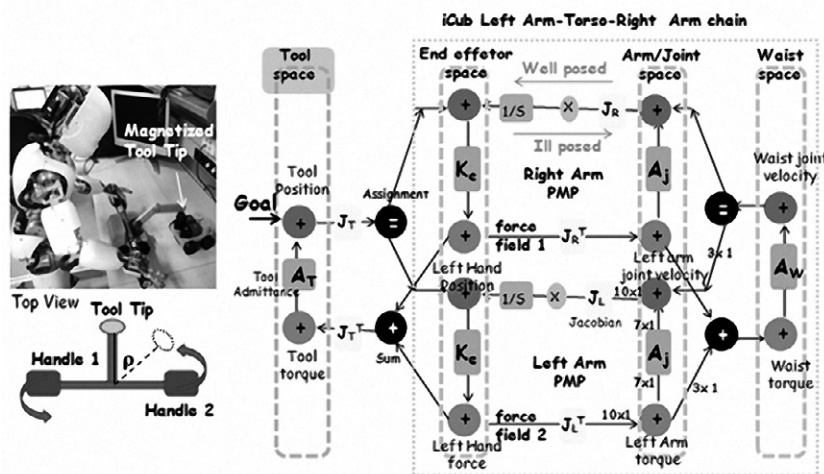


Figure 1. PMP network for Goal directed coordination of iCub ‘Upper body + Toy Crane’

the rest of the network is elastically reconfiguring itself so as to allow the tool tip reach the goal. For a formal interpretation of the attractor dynamics in the PMP mechanism, the reader is requested to refer to (Mohan et al. 2011b). Now we presents experimental results on what changing ‘Compliance’ implies in terms of cognition. Moving to row 1 of fig. 2, we refer to this as the normal condition i.e., a situation where both the tool is compliant ($A_T=0.01$) and both arms equally functional to generate force ($K_e=0.01$ for both arms). As seen in panel 1, the tool angle (green) faithfully tracks the moving point attractor or the goal (red). Panel B-D; show the resulting trajectory of the tool tip from the initial condition to the goal, the X-Y components of the force exerted by the two hands and the resulting torque in the tool space. Since the tool torque is bell shaped, the tool velocity is also bell shaped. Now, let us consider that for some reason (injury, etc), the right arm cannot functionality exert the same force of the left one ($K_e=0.0001$ for the right hand and $K_e=0.001$ for the left hand). Panels 5–8 of figure 2 show the resulting behavior. Observe that the actual tool trajectory still follows the goal (panel 5) and the tool tip almost reaches the target (panel 6), despite the fact that right arm functionality was compromised ‘ten times’ that of the left arm. The reason is that the left arm covers up the functional disability of the right arm by exerting a greater

force (Panel 7), compared to the normal condition (Panel 3). No learning is needed to accomplish this; it is in fact the property of the attractor dynamics of the ‘elastic’ PMP system to take into account such situations (be it injury, external disturbance, etc) and yet do the best in achieving the goal. Now let us consider the scenario where the ‘Toy crane’ was an alive ‘human being’ instead. The only difference is that instead of being a lifeless ‘Toy Crane’, the human has a choice to ‘comply’ to the external force exerted by some other system, by controlling one’s own admittance. A scenario where the human chooses ‘not’ to comply is shown in column 3 of fig. 2 (where $A_T=0.01$). Note that even though the external system connected to the body is not ‘compliant’, still an attempt to achieve the goal is done by the PMP network, by increasing the force exerted by both the arms (Panel 11), rather unsuccessfully but still, the network does its best to ‘persuade’. Also note that as a consequence of not realizing the goal, there is energy remaining in the network (since energy is an inner product of force and displacement, both of which are not zero in this case). So what is this ‘energy’ that still ‘exists’ in the body when a goal is not accomplished? Some may call it as ‘frustration’. But it can still be recycled for good purposes (since energy is conserved). One may also think of this scenario as two humans exerting force (physical or psychological) against each other,

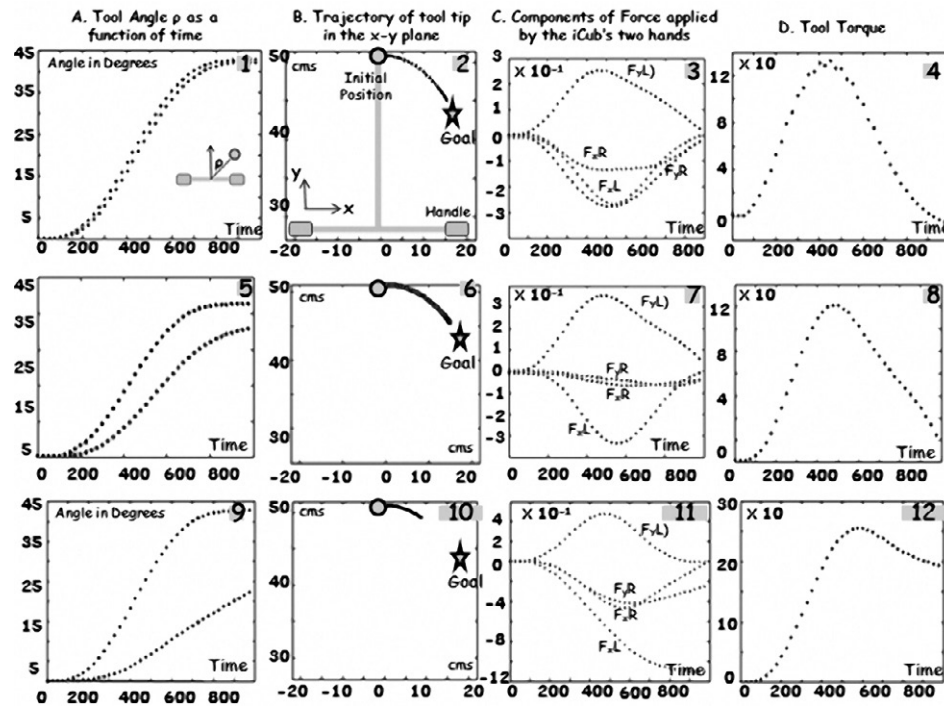


Figure 2. Row 1: Tool use under Normal Conditions; Row 2: Tool use when right arm functionality is compromised; Row 3: What if ‘toy crane’ is replaced by a ‘human’ who chooses not to ‘Comply’?

until someone complies or breaks down. Otherwise, there is no progress. So why are there rules? Rules are there to establish who will comply to the ‘force’ exerted by ‘whom’. A dictator always exerts force. In a democratic system, the majority exerts force, and the minority complies to the force. Otherwise there is a revolution, to reestablish the rules of ‘who’ complies to ‘whom’. Still going beyond, are there general principles in the PMP mechanism that go beyond ‘mechanical’ systems? Ongoing behavioral experiments with underactuated tool to be controlled in unstable tasks suggest that human can cognitively choose to be ‘compliant’ in different ways subjectively. Why we have the possibility to decide it? Are there implications?

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ИЗМЕНЕНИЕ ПОКАЗАТЕЛЕЙ КРЕАТИВНОСТИ С ПОМОЩЬЮ СЕМАНТИЧЕСКОГО ПРАЙМИНГА

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Традиционно в психологии креативность рассматривается как стабильное свойство познавательной сферы или личности (см., например, Дружинин, 1999), подверженное ситуативным воздействиям (влияние эмоций, типа инструкции, уровня мотивации и т.п.), но не допускающее целенаправленного изменения своих характеристик подобным способом. Такой взгляд находит свое отражение в наиболее известных теориях креативности, предлагающих в качестве объяснительных механизмов «центральные» процессы, и в сложившихся способах ее измерения. Так, в соответствии с теорией С. Медника (Mednick, 1962), креативность – способность устанавливать отдаленные ассоциации, соответствующие условиям задачи, или же способность соединять разрозненные ассоциативные элементы в единое целое. На основе ассоциативных процессов происходит объединение совершенно разнородных элементов опыта, что и обеспечивает высокую оригинальность продуктов творческого процесса. В теории Дж. Мендельсона (Mendelsohn, 1964) различия в уровне креативности у разных людей объясняются разным объемом внимания: чем больше элементов одновременно попадает в поле внимания и, соответственно, в поле сознания человека, тем большее количество ассоциаций и ответов он может дать. Это происходит потому, что одновременная представленность в поле сознания большого количества элементов увеличивает количество аналогий и иных связей между ними, что позволяет использовать параллельное, а не последовательное сканирование. Исходя из теории Мартиндэйла, креативная идея – обязательно оригинальная, и в то же время соответствующая контексту, в котором она возникла. Процесс креативного мышления

заключается в установлении аналогии между известными, но ранее несвязанными между собой элементами. В теории Дж. Гилфорда (Guilford, 1950) креативность связывается с дивергентным мышлением, обеспечивающим определение и уточнение задачи и получение нескольких (иногда – очень многих) способов ее решения.

В противовес сложившимся представлениям в данной работе мы проверяем предположение о том, что креативность подвержена ситуативным воздействиям, которые способны значимо изменить ее характеристики. Основанием для такой гипотезы могут служить активно развиваемые в настоящее время исследования укорененного познания (*embodied cognition*) (см., например, Wilson, 2002).

В нашем исследовании мы предприняли попытку целенаправленного и предсказуемого воздействия на показатели креативности в экспериментальных условиях. Для измерения показателей креативности был использован тест Гилфорда (Wilson, Guilford, Christensen, 1953), в котором испытуемым необходимо придумать как можно больше возможных способов использования какого-либо хорошо знакомого им предмета (в нашем случае – кирпича). По результатам теста рассчитываются следующие показатели: оригинальность (частота встречаемости данного варианта по всей базе ответов – чем ответ менее частотен, тем более оригинален), продуктивность (количество ответов испытуемого). Было проведено несколько серий пилотажных исследований, в результате которых мы собрали базу ответов (порядка 1500 вариантов от 150 испытуемых). Все ответы были оценены 6 экспертами по критерию оригинальности. Эти оценки, а также подсчет частоты встречаемости каждого ответа по всей выборке (в процентах) позволили получить индексы оригинальности для всех ответов, которые мы использовали при анализе данных в экспериментальной серии. В основном эксперименте мы использовали

семантический прайминг для целенаправленного изменения показателей креативности ответов испытуемых на тест Гилфорда. Процедура была следующей. Из всех ответов, полученных в пилотажных сериях, были выбраны 2 частотных и 2 редких. Все испытуемые (студенты и аспиранты различных гуманитарных специальностей) последовательно выполняли три задания (два первых были разработаны с целью осуществить семантический прайминг определенных категорий ответов). 1) Испытуемым необходимо было составить и записать предложение с заданным словом. 2) Им давалось восемь пар слов, к каждой из которых надо было подобрать обобщение (по сути, назвать категорию). 3) Выполнение теста Гилфорда. В исследовании было три экспериментальные группы: первая ($n=20$) получила в заданиях на семантический прайминг две частотные категории («оружие» и «стройматериалы»), вторая ($n=21$) – одну частотную и одну редкую («оружие» и «игрушка»), а третья ($n=18$) – две редкие («игрушка» и «награда»). Семантический прайминг, активизировавший заданные категории (с которыми надо было составить фразы или которые являлись результатом обобщения), согласно нашей гипотезе, должен был повлиять на оригинальность и продуктивность ответов испытуемых в третьем задании.

Все полученные ответы испытуемых были оценены по оригинальности путем сопоставления с базой ответов и присуждения соответствующего индекса. Затем мы сравнили средние значения полученных показателей оригинальности и продуктивности испытуемых трех групп с помощью однофакторной ANOVA. Различия по оригинальности ответов между группами

оказались высокосignификантными $F(2,58)=6,084$, $p=0,004$. Дополнительная проверка с помощью апостериорных тестов продемонстрировала, что оригинальность ответов в группе, получившей две редкие категории ответов, значимо выше, чем в группе, получившей две частые категории (множественные сравнения по методу Шеффе $p=0,004$). Влияние наших экспериментальных условий на продуктивность ответов испытуемых оказалось незначимым.

Таким образом, получен факт значимого влияния семантического прайминга на показатель оригинальности ответов на тест Гилфорда. Обращают на себя внимание особенности изменения ответов испытуемых: активизация частотных или редких категорий ведет не к нарастанию/угашению количества вариантов подсказанных категорий, а к изменению интегральной характеристики ответов – их оригинальности. Это обстоятельство позволяет предположить, что в основе процессов креативности могут лежать базовые механизмы семантической памяти, а сами исследования креативности могут стать средством их изучения.

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О СЕМАНТИКАХ ФОРМАЛЬНЫХ КОГНИТИВНЫХ КАРТ. МЕЖДИСЦИПЛИНАРНЫЙ ПОДХОД

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В последние годы появляется все больше публикаций, как теоретических, так и прикладных, относящихся к когнитивным картам (КК) для представления знаний о сложных слабо-структурированных ситуациях. Современные приложения КК охватывают различные области, такие, как экономика, медицина, экология и многие другие, вплоть до принятия решений государственного уровня. Особое место в этом

спектре относится к типам КК, которые уместно рассматривать как формальные КК. Такие карты характеризуются более или менее формальной семантикой и становятся «вычислимыми», что позволяет применять формальные методы решения прикладных задач, начиная с имитационного моделирования.

Недавние исследования (Carvalho 2010, Abramova and Kovriga 2011), равно как и выборочный анализ корпуса прикладных и исследовательских КК свидетельствуют о наличии ряда проблем, прямо или косвенно связанных с нечеткостью семантики ряда известных типов

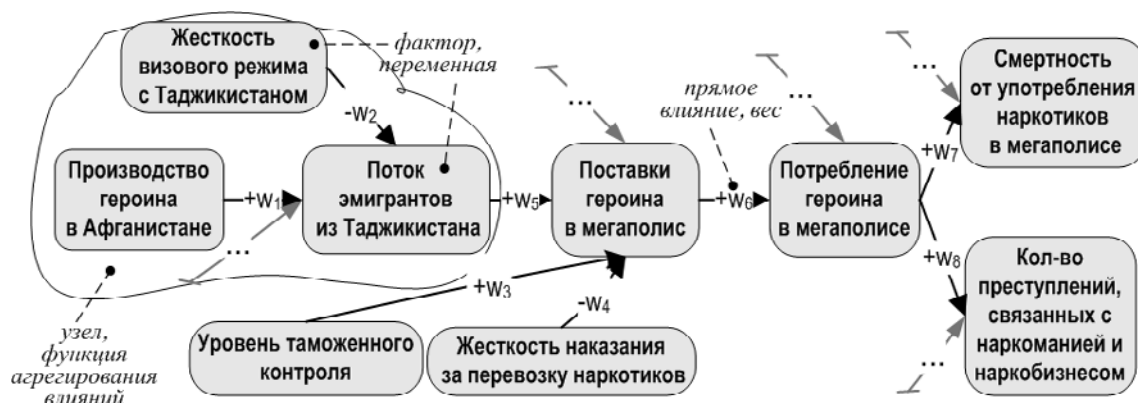


Рис. 1. Фрагмент когнитивной карты наркоситуации в мегаполисах РФ

КК. Это не только ограничивает развитие теоретических методов решения задач посредством представления знаний о проблемных ситуациях в виде КК, но и порождает разнообразные систематические риски для достоверности результатов решения практических задач, а иногда и прямые ошибки, не замечаемые решателями.

Эти проблемы приводят к целесообразности обращения к семантике КК как к предмету более углубленного исследования.

Объектом исследования в данной работе является открытое семейство типов КК, которые названы функциональными картами (Abramova et al. 2011). Оно включает типы карт «в духе Коско», которые принято называть нечеткими КК (их семантический аспект исследован в работе Carvalho (2010)) и карты «в духе Робертса». Фрагмент КК такого рода с выделенными примерами элементарных семантических конструкций представлен на рис. 1.

Представленная ситуация характеризуется факторами-переменными (нередко называемыми концептами), которые связаны прямыми причинно-следственными влияниями. С каждым узлом связывается математическая функция агрегирования влияний, в которой веса влияний (приписанные связям) являются параметрами. Типы функциональных карт в семействе различаются, главным образом, в зависимости от того, какой именно тип функции агрегирования влияний принят. Как правило, эти функции в большей или меньшей степени близки к линейным.

Поиск средств описания и анализа семантики современных функциональных карт и моделей ситуаций на их основе, в контексте проблемы рисков для достоверности результатов их применения и искажающих эффектов при формализации первичных знаний и осмыслении результатов формализованного решения практических задач, привел к целесообразности

рассматривать, по крайней мере, четыре вида семантик функциональных карт.

Наиболее значимой является оппозиция формальной семантики (F-семантики) определенного типа карт и его «интуитивной» интерпретации, выраженной на естественном языке (N-семантики). Различные виды N-семантик сегодня определяются со стороны теоретиков посредством тех или иных шаблонов, которые более или менее упрощенно вербализуют математический смысл прямого причинно-следственного влияния одного фактора на другой в расчете на снижение когнитивной нагрузки на составителей карт. Показано, что такое упрощение создает риск существенного искажающего эффекта при формализации первичных знаний о ситуации.

В терминах модели четырех семантик был проведен первичный анализ элементарных семантических конструкций карт семейства функциональных карт, включая факторы-переменные, связи-прямые влияния и узлы с функциями агрегирования влияний. Анализ позволил идентифицировать ряд известных на сегодня типовых рисков искажающих эффектов при моделировании сложных ситуаций посредством когнитивных карт (Abramova and Kovriga 2011) как последствия нечеткостей в определении семантики таких карт (риски второго рода).

Однако некоторые типы рисков, такие, как нетривиальный риск ложной транзитивности влияний вместе с риском несоразмерной общности понятий (Abramova and Kovriga 2008), риск неадекватного назначения весов влияний, не укладываются в модель четырех семантик, включая F-семантику. Помимо традиционной «сильной» семантики, требуется учитывать не только «слабую» семантику концептов, соответствующих факторам, но и когнитивные особенности составителей карт при работе с нечеткой

семантикой, такие, как склонность к избеганию когнитивной нагрузки.

По мнению автора, главный методологический итог проведенного анализа состоит в том, что при сложившемся разделении и даже противопоставлении теоретических подходов к изучению семантики языков (см., например, Saarinen 1986, Кобозева 2000), решение практически значимого вопроса о том, как определять семантику языков когнитивных карт для обеспечения приемлемой адекватности их применения, требует интегрированного учета факторов, значимых в рамках разных подходов. Ответ на поставленный вопрос, с учетом систематически действующих когнитивных факторов риска для достоверности результатов моделирования сложных слабоструктурированных ситуаций посредством когнитивных карт при нынешних

традициях описания их семантики, является предметом дальнейших междисциплинарных исследований.

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МОДЕЛИРОВАНИЕ УПРАВЛЕНЧЕСКИХ ПРОЦЕССОВ В КОГНИТИВНОЙ ЭКОНОМИКЕ

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Предметом когнитивной экономики является изучение процессов оценки, выбора и принятия решений человеком в экономической деятельности и объяснение природы эволюции организаций и социальных институтов в условиях структурной неопределенности [1-3]. Когнитивные технологии в экономике основаны на применении когнитивной науки для исследования моделей принятия экономических решений в сознании человека.

В работе приводится описание одного из подходов к построению современных экономических систем — гибридных систем на основе нечетких когнитивных карт и иерархий Саати и освещено его применение в сфере поддержки принятия решений.

Задачи, решаемые с помощью когнитивных карт, заключаются в нахождении и оценивании влияний факторов ситуации, и получении на основе вычисленных влияний прогнозов развития ситуации. В настоящее время для вычисления влияний и прогнозов развития ситуации

широкое применение находят нечеткие когнитивные карты (НKK).

НKK представляет собой нечеткий ориентированный граф с обратной связью, узлы которого являются нечеткими множествами. Направленные ребра графа отражают причинно-следственные связи между понятиями и численно характеризуют степень влияния (вес) связываемых понятий. Сила влияния между факторами, в отличие от простых когнитивных карт, задаются с помощью лингвистических значений, выбранных из упорядоченного множества возможных сил влияний, а значения факторов, их приращения также задаются в лингвистическом виде, и выбираются из упорядоченных множеств возможных значений фактора и его возможных приращений — шкал факторов и шкал приращений.

НKK объединяют в себе свойства нечетких систем и нейронных сетей, то есть НKK являются нейронными сетями, обучаемыми с учителем: чем больше данных доступно для моделирования задачи, тем более адаптивной является НKK в плане развития и выработки подходящего решения. Таким образом, НKK хорошо подходят для задач поиска решения на множестве альтернатив.

В интеллектуальных системах поддержки принятия решений, использующих когнитивные методы анализа сознания людей, кроме когнитивных карт также широко используются знаковые графы, сетевые модели, графы причин

и следствий, каузальные сети. Очень близким по смыслу к когнитивным картам являются байесовские сети, сети доверия, аналитические сети Саати.

Все эти модели можно назвать когнитивными сетями поддержки принятия решений (КСППР). Применяются также и гибридные интеллектуальные системы на основе КСППР, которые занимают важное место в решении задач когнитивной экономики. Они являются основой систем когнитивной бизнес-аналитики, использующих интеллектуальные системы с настройкой на сознание и логику эксперта и состоят из когнитивной и аналитической части, причем нижний уровень – когнитивный, предоставляет информацию для обработки верхним, аналитическим, уровнем [4]. Когнитивный уровень помогает использовать когнитивные способности человека, возможности комплексного восприятия ситуации и его ментальные модели для управления процессом принятия решений в сложных ситуациях. Аналитический уровень позволяет оценивать ситуацию и использовать эту оценку для принятия решений.

В походе на основе КСППР можно пойти несколько дальше и расширить возможности традиционного когнитивного подхода как за счет явного моделирования ментального пространства человека, так и за счет методов гибридизации КСППР с аналитическими моделями принятия решений и рассмотреть КСППР как интерфейс с формальными моделями, исправляющий возникающие на входе системы возможные когнитивные ошибки [5,6].

В качестве примера подобного подхода можно привести интегрированную модель поддержки принятия решений [7]. В данной работе рассматривается модель поддержки принятия решений в слабоструктурированных динамических ситуациях, основанная на интеграции нечеткой иерархической модели оценивания и нечеткой когнитивной модели ситуации. Интегрированная модель, в отличие от каждой из составляющих ее моделей поддерживает все этапы процесса поддержки принятия решений. Анализ ситуации основывается на декомпозиции цели, определенной экспертом, и структурно-функциональной декомпозиции ситуации, позволяющей с системных позиций описать поведение неструктурированной ситуации – ее динамики. Генерация решений – альтернатив осуществляется с помощью когнитивной модели. Выбор лучшего решения основан на оценивании прогнозов развития ситуации, полученных с помощью когнитивной модели в иерархической модели оценивания. В интегрированной модели

множество альтернатив не фиксировано, есть возможность конструирования альтернативы и оперативное получение ее оценки относительно достижения генеральной цели.

Таким образом, иерархическая модель оценивания альтернатив управления ситуацией и динамическая когнитивная модель ситуации описывают одну и ту же наблюдаемую ситуацию, но в разных аспектах. Модель оценивания описывает ситуацию с точки зрения цели управления ситуацией, степень достижения которой выражается через предпочтения эксперта относительно критериев, выраженных с помощью их весов и конкретных значений множества листовых критериев, представленных в некоторой шкале. В динамической модели ситуации описываются изменения значений факторов во времени безотносительно их важности для достижения поставленной цели. Эта модель качественно описывает динамику развития ситуации, представленную в качественных шкалах факторов ситуации.

Интегрированная модель позволяет оценивать изменения текущего состояния ситуации, что позволяет использовать ее в системах мониторинга состояния ситуации. Разработанная интегрированная модель поддержки принятия решений может служить теоретической основой для разработки компьютерной системы поддержки принятия решений в неструктурированных ситуациях, основанной на моделировании знаний и предпочтений эксперта.

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РЕДУКЦИОНИЗМ УМЕР! ДА ЗДРАВСТВУЕТ РЕДУКЦИОНИЗМ!

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Под редукционизмом в психологии понимают сведение причинных оснований изучаемого явления к той сфере реальности, к которой само это явление не относится. Таким образом, редукция используется, когда необходимо объяснить тот или иной факт.

Хотя редукционизм часто открыто и осуждается как «один из худших видов «методологического криминала» (Юревич, 2006), он весьма широко распространен в психологии. Парадокс: с одной стороны, редукционизм предается анафеме, с другой, он де-факто стал нормой в исследовательской практике. Даже те, кто на словах порицает редукционизм, допускают возможность одни психические феномены трактовать с физиологических позиций (мол, «так работает мозг»), а другие – в контексте социальных процессов («когнитивные процессы, сознание человека формируются внутри социальных отношений; психические явления социально детерминированы»). И чем ближе изучаемый феномен к плану телесности или, напротив, общественной жизни, тем больше возникает соблазн использовать соответствующие редукционистские построения. Поэтому вопрос о том, как относиться к редукционизму, не может быть решен без прояснения позиции относительно предмета психологии. Если в предметную область включать явления физиологической и социальной природы (казалось бы, как же иначе, ведь человек – биосоциальное существо), тогда возможны любые объяснения, любая редукция. Тогда действительно «позволено все»: когнитивные эффекты работы сознания можно объяснять состоянием мозга, социокультурной средой или божественным установлением. Если же предметом психологии считать только психические явления, то редукция в ее традиционных разновидностях – запрещенный прием. Но что примечательно: даже определяя предмет изучения в границах психической феноменологии, психологи довольно терпимо относятся к редукционистским уловкам.

Похоже, редукционизм – родимое пятно психологии. Редко можно встретить биолога, физиолога или социолога, которые бы, сталкиваясь с трудностями объяснения биологических, физиологических или социальных явлений, спешили за помощью к психологу. Но между тем

все, конечно, понимают, что в отсутствие у человека психической жизни невозможна и работа телесного носителя и уж, тем более, не возникнут никакие социальные процессы и феномены. Но только психологи, не справляясь с решением собственных исследовательских задач, ищут поддержки у физиологов или представителей социальных наук. Повторюсь: такое положение дел вызвано неопределенностью, размытостью границ предметной области психологической науки. Если предметом психологии считать все, что так или иначе имеет отношение к человеческому существу, начиная с наследственной предрасположенности и заканчивая отношением к Богу, то всякая редукция методологически оправдана. Когда наука изучает все, что угодно, то возможны любые объяснения.

Если же при интерпретации феноменов сознания (то есть всей осознаваемой когнитивной продукции) оставаться в границах психического, то представляется оправданным осознанные переживания объяснять неосознаваемыми психическими процессами, которые предваряют эти переживания. Иначе говоря, при объяснении психических феноменов допустим квазиредукционизм, предусматривающий объяснение осознаваемого психического через неосознаваемое психическое. Данная версия редукционизма не является умозрительной конструкцией. Множество экспериментов в когнитивной психологии показывает, что осознается всегда то ментальное содержание, которое до самого момента осознания уже наличествует в бессознательной психике, то есть уже подготовлено для осознания. Как указывал Ж. Пиаже, «осознание представляет собой ... реконструкцию на высшем – сознательном уровне элементов, уже организованных иным образом на низшем – бессознательном уровне» (цит. по: Inhelder, Chipman, 1976).

В этой связи уместно вспомнить также исследования Дж. Брунера и Л. Постмана по перцептивной защите. Этот экспериментальный эффект выражается в том, что для осознания эмоционально негативных слов, слов, несущих угрозу или табуированных в культуре (в их экспериментах использовалась нецензурная лексика), требуется большее время экспозиции. Другими словами, они осознаются дольше. Однако, ведь для того, чтобы произошла задержка осознания, нужно неосознанно уже понимать значение таких слов и неосознанно принимать решение об отсрочке осознания. В свою очередь, О.К. Тихомиров с коллегами уже

в области психологии мышления экспериментально показали, что за несколько секунд до инсайта, то есть до осознания решения мыслительной задачи, испытуемые неосознанно это решение уже обнаруживали, демонстрируя так называемое «эмоциональное предвосхищение» позже обнаруженного осознанного понимания. Иначе говоря, в момент инсайта происходит осознание ранее найденного, но еще не осознанного решения.

Весьма впечатляющими видятся результаты исследований, проведенных в последние годы психофизиологами. Так, установлено, что мозг «принимает решение» примерно за 7-30 секунд до того, как человек это осознаёт. Использование метода функциональной магнитно-резонансной томографии позволяет показать, что человек собирается солгать или его решение будет ошибочным еще до момента осознания (Eichele, Debener, Calhoun, Specht, Engel, Hugdahl, Cramon, Ullsperger, 2008). Следует отметить, что физиологические проявления наряду с вербальными, моторными реакциями и продуктами деятельности человека могут рассматриваться как индикаторы тех неосознаваемых процессов, которые предваряют психические продукты. Исходя из этого, физиологические реакции лишь маркируют неосознаваемые психические процессы. Физиологическое в этом случае выступает лишь как проявление бессознательного,

в недрах которого подготавливается всякое осознанное переживание. При этом физиологические индикаторы, конечно, не являются уникальными свидетельствами обработки информации вне осознания. В настоящее время существует множество экспериментальных возможностей, предполагающих экспликацию неосознаваемого (см. Агафонов, 2007; По обе стороны..., 2012).

Таким образом, при объяснении любых результатов когнитивной деятельности, любых фактов осознаваемого опыта следует совершать редукцию к предполагаемым протосознательным психическим процессам.

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ПСИХОФИЗИОЛОГИЧЕСКИЕ МЕХАНИЗМЫ ВЗАИМОДЕЙСТВИЯ СУБНАВЫКОВ ПРИ ФОРМИРОВАНИИ И РЕАЛИЗАЦИИ ДИНАМИЧЕСКИХ СТЕРЕОТИПОВ

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Важным механизмом операторской деятельности, особенно при использовании современных тренажеров, является оценка динамики формирования перцептивных, сенсомоторных и интеллектуальных навыков, эффективность и качество которых определяется физическими параметрами и значимостью пусковых стимулов, текущим функциональным состоянием (ФС) и индивидуальными особенностями оператора (Анохин, 1980, с.50; Данилова, 1992, с.15; Ильин, 1978; Леонова, 1984, с.81; Медведев, 1988; Фролов, 1987, с.36). Для исследования механизмов, лежащих в основе сенсомоторной интеграции (СМИ), и механизмов, влияющих

на ее эффективность, использовались следующие тестовые процедуры: простая и сложная сенсомоторная реакция (СМР), odd-ball reaction, прямая и обратная маскировка, реакция слежения, сложный стереотип с образными и вербальными задачами, компьютерный набор текста и т.д. Физические параметры определялись модальностью стимулов (зрительная, слуховая), а ФС – межстимульным интервалом. В ходе эксперимента регистрировались вегетативные параметры (пневмограмма, ритмограмма сердца), ЭЭГ, связанные с событием потенциалы (ССП) и время реакции (ВР).

В каждом сложном стереотипе были выделены элементарные субнавыки (перцептивные, сенсомоторные и интеллектуальные), которые существенно изменяли свои характеристики по сравнению с условиями их изолированной реализации. Выработка стереотипа была связана с

гетерохронностью формирования субнавыков, что определялось вовлечением различных механизмов.

При исследовании реакции слежения были выделены три субнавыка (скорость реагирования на стимул, время перемещения, время совмещения), эффективность которых зависела от частоты предъявления стимула и межстимульного интервала (МСИ), а их последовательная реализация коррелировала с развитием основных компонентов ССП на стимул.

Сложный стереотип с образными и вербальными задачами формировался несколькими основными субнавыками (восприятие стартового стимула, ответная реакция, время удержания и отжатия), которые изменяли в процессе обучения свой уровень приоритетности и автоматизации, сокращая общее время решения тестовой задачи.

Для оценки эффективности навыка решения арифметических задач дополнительно вводилась конкурирующая задача (простая СМР на звук), эффективность реализации которой имела обратно-пропорциональную зависимость от вовлеченности испытуемого в решение арифметических примеров. По параметрам ВР были выделены 3 уровня когнитивного напряжения, соотношение которых изменялось индивидуально и зависело от уровня вовлеченности в основную задачу и количества ошибок.

Анализ психофизиологических особенностей решения арифметических примеров на сложение и умножение выявил существенные различия алгоритмов с повышенным требованием к ресурсам кратковременной памяти при умножении, демонстрируя активацию зон Брока и Вернике по параметрам ЭЭГ в левом полушарии.

Исследование процессов, связанных с компьютерным набором текста, позволило выделить ряд субнавыков, связанных с чтением, удержанием в памяти, набором на клавиатуре требуемого текста, которые имели гетерохронную динамику в процессе формирования «словарных» (с высоко автоматизированным набором) слов.

Полученные результаты показали, что относительно простые навыки из указанного ряда

характеризовались четко выраженным взаимодействием лобной и центральной системы внимания, формируя лобно-затылочную и билатеральную асимметрию мозга. Увеличение межстимульного интервала изменяло баланс между указанными системами. Данные изменения лучше всего наблюдались в дельта-ритмическом диапазоне (транскортикальные модуляционные взаимодействия) и в тета-колебаниях (лобно-затылочный градиент), связанный с анализом пусковых стимулов.

Переход к сложным динамическим стереотипам приводил к появлению мощной дельта-волны, не коррелирующей с элементами стереотипа, которая характеризовалась периодической миграцией фокусов максимальной выраженности в лобно-затылочном направлении. Каждый из элементов стереотипа «подстраивался» к тому или иному фрагменту дельта-волны.

Изменение ФС на этапе автоматизированных навыков было связано с изменением характера взаимодействия лобной и затылочной систем внимания, что приводило к изменению баланса произвольного и непроизвольного внимания. При усилении уровня активации доминировала лобная система, при снижении – теменная.

В работе обсуждается роль вегетативных механизмов, уровня общей и локальной активации в формировании и активации динамических стереотипов различного уровня сложности.

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СХОДСТВО СТРУКТУР ЗНАНИЯ У ВЗАИМОДЕЙСТВУЮЩИХ ИНДИВИДОВ: КАКИЕ СОСТАВЛЯЮЩИЕ СТРУКТУРЫ ЛЕЖАТ В ЕЁ ОСНОВЕ?

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В процессе совместной деятельности формируются психологические структуры, которые обладают сходством у взаимодействующих индивидов (Максимова, Александров, 2009). Используя весьма детализованное описание структуры знания (СЗ), которая формируется у каждого из партнеров по стратегической игре (Александров, 2006), представляется возможным установить, какие именно из основных составляющих СЗ являются носителями такого сходства: метастратегии и домены. Метастратегии представляют собой структуры, интегрирующие и координирующие частные стратегии, т.е. группы компонентов, соответствующие устойчивым последовательностям актов игры (Александров, Максимова, 2009; 2010). Домены – это группы компонентов, обладающих свойствами, общими для определенных взаимодействий с предметной областью, объединенных синхроническими отношениями AND, XOR и IOR (Александров, 2006). Цель работы заключалась в том, чтобы сравнить вклад метастратегий и доменов в формирование сходства СЗ у взаимодействующих партнеров по деятельности.

Методика. Участники исследования (40 человек трех возрастных групп: 6.5–7.8 лет, 14 чел.; 12.1–12.75 года, 14 чел.; 16.9–18.75 года; 13 лиц женского, 27 – мужского пола) формировали компетенцию в стратегической игре двух партнеров (крестики и нолики на поле 15×15). Для каждого игрока на основе протоколов игры, описывающих последовательность ходов в терминах координат игрового поля, с помощью специальных алгоритмов реконструировали СЗ в предметной области стратегической игры в терминах компонентов, отношений между ними, частных стратегий, метастратегий и доменов. Метастратегии и домены описывали как ориентированные графы, в которых вершины представляют компоненты СЗ, или группы компонентов – как «стянутые подграфы» (Евстигнеев, Касьянов, 1999), а дуги – отношения между ними. Для описания метастратегий применена 21 переменная, для доменов – 25. Чтобы сократить размерность описания, исключали переменные, без которых оказывается возможным разделить выборку на группы (иерархический кластерный анализ, метод Ward, расстояния

block-city), надежно воспроизводимые при помощи дискриминантного анализа (процедура с исключением переменных backward). В результате этого сокращения метастратегии были описаны при помощи 7 переменных: индекс Рандича (Trinajstić, 1983), количество и вершин и дуг в графе, распределение компонентов СЗ по вершинам графа, количество петель и сложных циклов, а домены – 12 переменных: количество изолированных подграфов (отдельных доменов), количество вершин в графе (компонентов СЗ), оценки сложности организации графа (домена), включая энтропийные, характеристики субграфов (субдоменов и их пересечений). Для оценки сходства организации СЗ использовали расстояния между точками, представляющими СЗ каждого игрока в пространстве, построенном при помощи процедуры многомерного шкалирования (Proxscal, SPSS). Для пространств, построенных на описании метастратегий и доменов, сравнивали распределения расстояний для СЗ у игроков, формировавших компетенцию совместно – в одной диаде или раздельно – в разных диадах. Для этого использовали точные непараметрические тесты (Манна-Уитни, Колмогорова-Смирнова, Краскалла-Уоллиса, медианный тест).

Результаты и их обсуждение. Для описания СЗ, построенного на множестве переменных, которые описывают свойства метастратегий, показано, что расстояния между точками, представляющими СЗ у актуальных партнеров по игре, достоверно меньше расстояний между точками, представляющими СЗ у лиц, которые формировали компетенцию в разных диадах. Такое же соотношение показали все примененные точные статистические критерии (Манн-Уитни: $Z = 2.49, p = 0.013$; Колмогоров-Смирнов: $Z = 1.53, p = 0.018$; Краскалл-Уоллис: $\chi^2 = 6.21, df = 1, p = 0.013$; медианный тест: $\chi^2 = 7.32, df = 1, p = 0.011$). Для описания СЗ, построенного на множестве переменных, описывающих организацию доменов, различия в распределениях расстояний у партнеров, формировавших компетенцию в одной и той же диаде и в разных диадах, не выявлено ни по одному из примененных критериев: (Манн-Уитни: $Z = 1.81, p = 0.070$; Колмогоров-Смирнов: $Z = 1.16, p = 0.114$; Краскалл-Уоллис: $\chi^2 = 3.26, df = 1, p = 0.071$; медианный тест: $\chi^2 = 1.85, df = 1, p = 0.174$).

Приведенные оценки показывают, что сходство СЗ у взаимодействующих партнеров

формируется за счет согласованности организации метастратегий, но не доменов. Из полученного соотношения следует, что общность СЗ у партнеров по деятельности достигается не в результате пересечения компонентного состава СЗ, поскольку домены и метастратегии реализуются на одном и том же наборе базовых компонентов СЗ. Каждый компонент СЗ может вступать в отношения различного типа, при этом образуется неоднородная семантическая сеть. Отношения диахронического типа связывают компоненты в ориентированную семантическую пропозициональную сеть, на которой выделяются метастратегии, т.е. совокупности согласованных частных стратегий, которые позволяют как строить планы собственных действий, так и прогнозировать действия партнера по стратегической игре. Синхронические отношения образуют семантическую ассоциативную сеть, на которой определены домены, т.е. совокупности компонентов, отношения между которыми за счет взаимных запретов, ограничений и предпочтений актуализируют такие подмножества компонентов, на которых возможна реализация тех или иных метастратегий. Таким образом, именно метастратегии могут служить

основой для формирования надиндивидуальных психологических структур, обеспечивающих совместную деятельность, в то время как домены можно рассматривать как более индивидуальные психологические образования.

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ЭПИГЕНЕТИЧЕСКИЕ МЕХАНИЗМЫ В ПРОЦЕССАХ СИСТЕМОГЕНЕЗА

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Особенностью исследований в области эпигенетики поведения на ранних этапах развития мозга является обращение к процессам развития и адаптивной пластичности. Этот подход обусловлен их одновременным протеканием и перекрыванием на молекулярно-клеточном уровне. В рамках теории системогенеза (П. К. Анохин, 1948) рассмотрение проблемы долговременных модификаций поведения, обусловленных эпигенетическими воздействиями на организм в перинатальном периоде его развития, помещается в область взаимоотношений между процессами первичного и вторичного системогенеза (К. В. Анохин, 1996), а зонами одновременного протекания и перекрывания этих процессов являются эволюционно предуготовленные функциональные системы на этапе их минимального обеспечения. В качестве механизма, обеспечивающего долговременность, рассматриваются

модификации экспрессии регуляторных генов, запускающих долговременные изменения наборов клеточных элементов системы (Анохин К. В., 1996), являющихся фокусом конвергенции эпигенетических воздействий через процессы метилирования ДНК, модификации гистонов и взаимодействие между ними в опыт-зависимых процессах долговременной пластичности. В качестве гипотетических механизмов рассматриваются также активность мобильных генетических элементов и синтез ДНК.

Цель настоящего исследования – изучение роли указанных молекулярных механизмов в созревании и адаптивных модификациях функциональных систем в раннем онтогенезе. В работе исследовалось участие механизмов активации генов, активности мобильных генетических элементов, модификации гистонов и взаимодействие между ними в опыт-зависимых процессах в развивающемся мозге. Работа выполнена на мышцах инбредных линий C57Bl/6 и 129 sv. В исследовании использованы модели перекрестного выращивания потомства двух линий мышей, перинатального и раннего постнатального обучения, экспериментальное изменение

уровня ацетилирования гистонов, исследованы паттерны экспрессии транскрипционного фактора c-Fos, проведена детекция маркеров ацетилирования гистонов в мозге мышей.

Полученные нами данные позволяют заключить, что рассмотренные эпигенетические механизмы долговременной модификации в развивающемся мозге на этапе перинатального и раннего постнатального развития реализуются через опыт-зависимые процессы. Мишенями этих процессов являются геномы клеток, входящих в состав созревающих функциональных систем. Значимость и долговременность последствий эпигенетических воздействий в раннем онтогенезе для взрослого поведенческого фенотипа обусловлена особенностями функциональных систем, находящихся на стадии минимального обеспечения. Полученные данные о молекулярных и клеточных механизмах долговременной модификации поведения актуальны для решения проблем, обусловленных ранним периодом развития организма: заболеваний, манифестация которых зависит от условий

перинатального развития, экологических и социо-культурных факторов среды (Tal O, Kisdi E, Jablonka E, 2010; Degnan, Almas, Fox, 2010), проблем, связанных с детской травматической памятью (невротические, постстрессорные состояния и др.) (Kaffman, A., and Meaney M.J., 2007; Moriceau S. et al. 2009).

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ИМПРЕССИВНАЯ (СЕНСОРНАЯ) АЛАЛИЯ – ЯЗЫК БЕЗ ЯЗЫКОВОЙ КОМПЕТЕНЦИИ?

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Синдром импрессивной (сенсорной) алалии иначе называют специфическим расстройством развития рецептивной речи (F80.2 МКБ=10). При данном синдроме ребенок без видимых интеллектуальных расстройств, обладающий достаточным слухом, не начинает вовремя понимать обращенную речь и, как следствие, говорить. Этиология неизвестна, прогноз в отношении формирования языковой коммуникации неблагоприятный.

Понимание речи может нарушаться по-разному. Так, детям с экспрессивной алалией нередко сложно понимать грамматические (например, предложные) конструкции или различать на слух слова, близкие по звучанию, но понимание общего смысла инструкций, бытовой речи не страдает. Симптоматика сенсорной алалии иная: для данного синдрома характерно непонимание именно общего смысла высказываний, в том числе и простейшей бытовой речи. Подобные нарушения встречаются в клинике афазий вследствие структурного повреждения мозга как у детей, так и у взрослых

(сенсорная афазия), но, как правило, только в остром периоде, затем происходит компенсация. Стойкое нарушение понимания речи, подобное сенсорной алалии, наблюдается при синдроме Ландау-Клеффнера. В то же время при тяжелых нарушениях интеллектуального развития понимание общего смысла высказываний является доступным: «Даже глубоко отстающие в умственном развитии дети (имбецилы и даже идиоты) понимают бытовую речь. Даже животные понимают отдельные слова и стереотипные фразы» – рассуждает Н.Н. Трауготт (1994) о редкой симптоматике сенсорной алалии.

Н.Н. Трауготт (1994) так описывает особенности поведения сенсорных алаликов: «По общему рисунку поведения не отличаются от нормальных сверстников. Инициативны, достаточно общительны, часто любят рисовать... Однако с возрастом ребенок начинает сознавать свою неполноценность, становится более замкнутым, капризным». Речевая активность сенсорных алаликов очень высокая: ребенок почти всегда что-то говорит, хотя часто совершенно невнятно, нет страха перед речью. Заметив, что его не понимают, использует жесты. При сенсорной алалии нередко наблюдаются эхолалии: ребенок повторяет слово или фразу, сказанную

взрослым, но не понимает их смысла. Этот явление связано с тем, что способность повторять сформировалась раньше, чем способность понимать. Иногда присоединяются поведенческие расстройства, обычно в форме гиперактивности.

Исход импрессивной алалии, по нашим наблюдениям, может быть различным: в некоторых случаях наблюдается спонтанная компенсация дефекта и понимание речи формируется с опозданием, но в нормальном виде (т.е. ребенок начинает понимать речь окружающих легко и произвольно, как здоровые дети), затем происходит становление разговорной речи. В других случаях понимание речи начинает формироваться ближе к возрасту 4 лет и в измененном виде: при хорошо организованной педагогической работе дети с импрессивной алалией постепенно учатся понимать отдельные слова и говорить, но сложным или недоступным остается понимание текста, развернутых сообщений. Даже выученные, т.е. уже знакомые слова, ребенок узнает в потоке речи не всегда. Активный словарь превышает пассивный, т.е. дети не всегда понимают слова, которые говорят.

Н.Н. Трауготт (1994) описывает ситуацию, когда сенсорный алалик понимал и выполнял вербальные инструкции, если вознаграждением за правильный ответ были конфеты, которые мальчик любил, но он переставал понимать инструкции, если меняли сорт конфет. В результате исследований Н.Н. Трауготт делает вывод: ребенок понимает обращенную речь, *когда захочет*. Так же описывают поведение детей с импрессивной алалией и их родители: ребенок то демонстрирует явное понимание речи, то ведет себя как глухой.

Анализ возможностей компенсации дефекта и методик, применяемых при работе с этими детьми, показывает, что сенсорные алалики при освоении языка опираются на произвольное понимание речи. Основной чертой произвольного поведения является его осознанность. Дети осваивают отдельные слова, стереотипные выражения, и этот процесс напоминает обучение иностранному языку.

Произвольность и непроизвольность – общие характеристики любого психического процесса, отражающие двойственность биологической организации мозговых функций. В норме обе стратегии обработки информации сосуществуют, дополняют друг друга и трудноразделимы. При патологии возможна диссоциация, когда потеря одной из стратегий обработки информации вынуждает пациента опираться на сохранную.

Понимание речи при становлении языка у здоровых детей всегда несколько опережает навыки говорения, идет на несколько шагов впереди. Несомненно, что это понимание *непроизвольное*. При синдроме сенсорной алалии непроизвольное понимание речи, которое в норме является основой для освоения родного языка, выпадает. На четвертом году жизни в результате созревания мозга становится возможным *произвольное* понимание. Для здоровых детей произвольность становится дополнительным инструментом в познании мира и языка, а для детей с импрессивной алалией – единственно возможным способом понимать речь окружающих.

Согласно Паради (2004), здоровый человек обладает двумя способами говорить: имплицитная компетенция (implicit competence) и металингвистические знания (metalinguistic knowledge). Но эти способы могут функционировать изолированно: так, маленькие дети и неграмотные опираются лишь на языковую имплицитную компетенцию, а при патологии (генетическая дисфазия (genetic dysphasia)) и при изучении иностранного языка востребованы металингвистические знания. Используя данный подход и термины, – **при импрессивной (сенсорной) алалии невозможно формирование имплицитной компетенции и языковое развитие ребенка происходит с опорой лишь на металингвистические знания.**

Трауготт Н.Н. 1994 Как помочь детям, которые плохо говорят. С-Петербург

Paradis M. 2004 A Neurolinguistic Theory of Bilingualism. Amsterdam/Philadelphia John Benjamins

О СВЯЗИ ГРАММАТИЧЕСКОГО ПОРЯДКА СЛОВ И ФОНОЛОГИЧЕСКОЙ АКТИВАЦИИ

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В отечественной классической лингвистике в настоящее время остро стоит вопрос о ее будущем. Все более важное значение приобретают прикладные и междисциплинарные

исследования. Именно они могут задать направления дальнейшего развития лингвистики.

Особое место занимают психолингвистические исследования. В этой области отечественная наука заметно отстала от зарубежной (особенно в эмпирическом и экспериментальном плане), что является основанием для более тщательной разработки данного научного направления в целом и его отдельных вопросов в частности.

В последние десятилетия продолжают активно разрабатываться представления о ментальном лексиконе, заложенные прежде всего в зарубежных психолингвистических и когнитивных исследованиях Ch. Osgood, G. Dell, W. Levelt, J. Aitchison, K. D. Emmorey, V. A. Fromkin.

Хотя термин «ментальный лексикон» широко используется в публикациях последних лет, единое толкование этого феномена фактически отсутствует. Под ментальным лексиконом понимается «индивидуальный словарный запас» (Баранов, Добровольский 1997), «ментальные репрезентации слов и лексических единиц языка в долговременной памяти человека» (Carroll 1994, Schwarz 1995), «совокупность номинаций, упорядочивающих знания человека о мире» (Овчинникова 1994), «компонент грамматики, который содержит фонологическую, морфологическую, семантическую и синтаксическую информацию, то есть все, что говорящие знают об отдельных словах и/или морфемах» (Emmorey, Fromkin 1988) и др.

В процессе речепроизводства человек постоянно пользуется своим ментальным лексиконом, формулируя свою мысль и подбирая те или иные подходящие слова и лексические единицы. В структуре ментального лексикона выделяют концептуальный, семантический и фонологический уровни. Актуальным вопросом остаются закономерности и особенности активации каждого из этих уровней в процессе продуцирования отдельных слов, словосочетаний и предложений.

Научный интерес представляет проблема связи грамматического порядка слов и фонологической активации. При изучении данной проблемы можно опираться на опубликованные исследования Navarrette & Costa (2005) и Janssen, Alario & Caramazza (2008), в которых были получены противоположные и противоречащие друг другу данные. В исследовании Navarrette & Costa (2005) было показано, что, во-первых, названия объектов могут быть фонологически активированы, даже если не нужно называть сами объекты, а во-вторых, цвет объектов называется быстрее, если объект и цвет согласуются, т.е.

начинаются на один звук (напр., кран – красный) по сравнению с ситуацией, когда называются объекты не согласующиеся, т.е. не начинающиеся на одну и ту же букву с цветом (кран – синий).

В исследовании Janssen, Alario & Caramazza (2008) изучалось влияние грамматического порядка слов на фонологическую активацию. Перед испытуемыми ставилась задача называть цвет объекта либо сам объект. Сравнивались данные испытуемых, владеющих французским языком как родным, с данными испытуемых, владеющих английским языком как родным. Следует отметить, что во французском языке прилагательное стоит, как правило, после существительного, в то время как в английском прилагательное предшествует существительному.

Как показали экспериментальные данные, у французских пробандов были обнаружены эффекты согласования при назывании цвета и не обнаружены такие эффекты при назывании объектов. У английских пробандов, наоборот, были выявлены эффекты согласования при назывании самих объектов и не было обнаружено их при назывании цвета объектов. На этом основании в работе Janssen, Alario & Caramazza (2008) было выдвинуто предположение, что в языках, где прилагательное грамматически предшествует существительному, возникают эффекты согласования, в то время как они отсутствуют в языках, где прилагательное обычно ставится после существительного.

Данная гипотеза проверялась в работах Alekseeva, Maedebach, Jescheniak (2011) и Maedebach, Alekseeva, Jescheniak (2011), проведенных среди пробандов, владеющих немецким языком как родным. Здесь были обнаружены значительные (более 30 мс) эффекты согласования ($p < .001$) при назывании цвета объекта и не зафиксировано эффектов согласования ($F_s < 1$) при назывании самих объектов. В исследованиях были сделаны следующие обобщения: 1. Фонологические эффекты согласования при назывании цвета свидетельствуют о том, что названия самих объектов на фонологическом уровне активируются автоматически. 2. Отсутствие эффектов согласования при назывании объектов подтверждает гипотезу, что названия цветов не активируются автоматически на фонологическом уровне. 3. Полученные экспериментальные данные противоречат данным, опубликованным в Janssen, Alario & Caramazza (2008) и подтверждают данные, полученные в недавних научных работах на примере голландского языка (Kuipers & La Heij 2009) и данные, полученные на примере английского языка (Dumay & Damian 2011). Таким образом, на основании ряда проведенных

экспериментальных исследований был сделан вывод, что фонологические эффекты согласования при продуцировании отдельных слов не находятся под влиянием канонического (традиционного) грамматического порядка слов того или иного языка, а являются универсальными.

В настоящий момент отсутствуют подобные исследования на примере русского языка. Восполнение данного пробела могло бы внести существенный вклад в изучение изложенной проблематики.

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ИЗУЧЕНИЕ ОБРАЗНОГО УРОВНЯ РЕПРЕЗЕНТАЦИИ ПСИХИЧЕСКОГО СОСТОЯНИЯ

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Обращение к рефлексивным аспектам различных психических явлений, к их репрезентациям характерно для многих современных исследований.

Среди репрезентаций выделяют прежде всего ментальные репрезентации, которые могут рассматриваться и как процесс (процесс отражения, представления), и как результат, единица (описание опыта в рамках картины мира). Первый подход характерен прежде всего для зарубежной психологии, где акцент делается на процессуальной, динамической стороне ментальной репрезентации, на ее когнитивных функциях (Ришар, 1998, Cooper, 1990, Blatt, Auerbach, Levy, 1997, Kemp, 1998, Geller, Farber, Schaffer, 2010, Lukowitsky, Pincus, 2011). Второй подход отличает отечественную психологию (Андреева и др., 1998, Кубрякова, Демьянков, 2007), хотя стоит выделить и некоторые зарубежные работы (Bascos, Davies, Sturge, Cummings, 2009, Savadori, Nicotra, Rumiati, Tamborini, 2001, Lotto, Rubaltelli, Rumiati, Savadori, 2006). Ментальная репрезентация понимается как внутренние структуры, формирующиеся в процессе жизни человека, в которых представлена сложившаяся у него картина мира,

социума и самого себя (Андреева и др., 1998). Ментальные репрезентации со временем приобретают иерархическую структуру: выделяют их ассоциативный, оценочный, понятийный и образный уровни.

Исследования представлений о психических состояниях занимают особое место. Здесь изучается не субъективное отражение возникновения определенного состояния на основе переживания актуальной ситуации, а субъективное описание имеющегося опыта, представлений о состояниях.

Эмпирическое исследование образного уровня ментальной репрезентации психических состояний в зависимости от репрезентации ситуации было проведено при помощи методики «Рельеф психического состояния», предложенной А.О. Прохоровым. Данные анализировались путем математической, статистической обработки данных с использованием метода коротких статистик, попарного сравнения корреляционных матриц, а также статистического сравнения показателей по t-критерию Стьюдента.

Рассмотрим пару ситуаций «наказание» и «похвала», где отмечается наибольшее количество достоверных различий как на уровне психических процессов, так и на уровне переживаний и поведения. Психические состояния, представленные в сознании испытуемых как типичные для ситуации «наказание», характеризуются: плохой осознанностью, размытостью,

нечеткостью восприятия, трудностью возникновения образов, ухудшением памяти, трудностью запоминания и воспроизведения, трудностью в понимании, ухудшением сообразительности, отсутствием логики мысли, трудностью что-либо придумать, ухудшением речи (появлением длительных пауз, запинок, увеличением количества лишних слов, слишком тихой речью, заиканием и пр.), слабостью, чувством неуверенности, ленью, ухудшением внимания, низкой способностью сосредоточиться на выполнении работы, отвлекаемостью. Психические состояния, типичные для ситуации «похвала», напротив, характеризуются хорошей осознанностью восприятия, ясностью, четкостью представлений, легкостью возникновения образов, улучшением памяти, легкостью запоминания, повышением сообразительности, высокой находчивостью, логичностью, легкостью образования новых ассоциаций, фантазированием, раскованностью; повышением речевой активности, увеличением громкости голоса, ускорением речи, ее логичностью, повышением уверенности в себе, легкостью в управлении собой, верой в успех, улучшением внимания, способности к сосредоточению, высокой увлеченностью работой. На уровне переживаний представления о типичных для ситуации «наказание» состояниях имеют тенденцию к следующим характеристикам: тоскливость, грустность, печаль, пассивность, вялость, напряженность, тяжесть, скованность, интенциональность переживаний опускает, погружает. Для ситуации «похвала» характеристики диаметрально противоположные: веселость, оптимистичность, задорность (страстность, запальчивость), активность, бойкость, раскрепощенность, легкость, раскованность, направленность переживаний характеризуется подъемом. На уровне поведения выявлены следующие отличия, характерные для представлений о состояниях, типичных для ситуации «наказание»: пассивность, непоследовательность, импульсивность, необдуманность, неуправляемость, неадекватность, неустойчивость, неуверенность, закрытость, замкнутость. Для ситуации «похвала»: активность, последовательность, целеустремленность, размеренность, продуманность, управляемость, адекватность, устойчивость, уверенность, открытость.

Все перечисленные различия обнаружены на уровне значимости $p=0,001$, что позволяет судить о достоверности данных, а также о том,

что психические процессы, шкалы переживаний и поведенческих характеристик являются чувствительными параметрами при изучении представлений о состояниях.

Таким образом, актуализируя индивидуальные представления о ситуации, для которой то или иное психическое состояние является типичным, можно в свою очередь актуализировать и представление о самом состоянии. Представления о психических состояниях в зависимости от ситуаций формируются на основании опыта переживания человеком определенных состояний в различных ситуациях жизнедеятельности, они закрепляются и могут быть актуализированы. Представления о психических состояниях являются более яркими при непосредственном нахождении в ситуациях, которые предполагают переживание тех или иных состояний, нежели представления о психических состояниях при обращении к опыту, актуализации ситуаций в памяти.

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ГЕНЕТИЧЕСКИЙ ПОДХОД К УСТАНОВЛЕНИЮ НЕЙРОБИОЛОГИИ КОГНИТИВНЫХ РЕЗЕРВОВ

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Известно, что существует большая межиндивидуальная вариативность в выраженности когнитивного снижения под воздействием факторов, нарушающих обычный модус работы мозга – старения, стресса, неврологических и психических заболеваний. Наблюдения позволяют предположить, что в основе этой вариативности лежит не только разная степень поражения мозга, но и неодинаковые компенсаторные возможности. Причем компенсация, вероятно, обеспечивается теми же нейронными механизмами, которые вовлекаются при повышении сложности когнитивных задач, стоящих перед здоровым человеком. Теоретической основой изучения этих механизмов может служить концепция пассивных и активных когнитивных резервов Я. Штерна (Stern 2002). Под когнитивными резервами понимают особенности строения и работы мозга, обеспечивающие поддержание нормального уровня когнитивного функционирования при возникновении нейропатологии. Нейробиология когнитивных резервов остается нераскрытой. Сложность задачи заключается в том, что для многих состояний, таких, например, как непатологическое старение, степень поражения мозга не может быть измерена. Кроме того, пока не предложены способы прямой оценки когнитивных резервов, исследователи вынуждены использовать косвенные показатели, такие, как IQ, уровень образования или характер профессиональной деятельности, предшествовавшие снижению когнитивных функций.

Молекулярно-генетический метод может дополнить данные о нейронных основах когнитивных резервов, получаемые с помощью применяемых в когнитивной нейронауке подходов с использованием IQ и нейровизуализации. Мы предприняли попытку выявить гены когнитивных резервов на модели шизофрении. Это заболевание развивается на почве генетической уязвимости и влечет нарушение когнитивных функций у большинства пациентов. Наша гипотеза состояла в том, что в группе лиц, predisposed к заболеванию, но остающихся здоровыми, должно наблюдаться накопление благоприятных аллелей генов когнитивных

резервов относительно здоровых без наследственного предрасположения к шизофрении и заболевших. Кроме того, таких аллелей должно быть больше у больных без когнитивных нарушений, чем у прочих больных и здоровых. При этом больные в целом не должны отличаться от общей популяции по частоте данного аллеля (т.е. ген не должен быть ассоциирован с заболеванием). Для анализа был выбран ген SNAP25. Кодированный им синаптосомный белок с молекулярной массой 25 кД является частью комплекса, обеспечивающего соединение везикулы с мембраной клетки и выброс нейромедиатора в синаптическое пространство. Показано также, что он играет важную роль в нейропластичности, связанной с обучением, во взрослом мозге и формированием синаптических связей в раннем онтогенезе (например, Osen-Sand et al. 1993). Основанием для выбора SNAP25 в качестве гена когнитивных резервов явились данные о предположительно компенсаторном повышении его экспрессии в дорсолатеральной префронтальной коре и поясной извилине больных шизофренией (Corradini et al. 2009), об ассоциации полиморфизма гена с интеллектом (Gosso et al. 2008) и собственные результаты, указывающие на влияние SNAP25 на целый ряд когнитивных показателей в общей популяции и в семьях больных (Голимбет и др. 2009).

По полиморфизму T1065G SNAP25 было прогенотипировано 278 больных шизофренией, 125 их здоровых родственников 1-й степени родства и 207 человек без наследственной отягощенности психозами. Для оценки когнитивной сферы больных ($n=69$) мы использовали интегральный показатель управляющих функций, вычисленный на основе выполнения тестов на селективное внимание, рабочую память и вербальную беглость. Больные были разделены на группы без когнитивного дефицита (35%) и с таковым (65%). К последним относили больных, значение когнитивного индекса у которых отличалось от нормативного среднего более чем на одно стандартное отклонение.

Гипотеза подтвердилась частично. Тенденция к накоплению лиц, predisposed к шизофрении и обладающих благоприятным аллелем (G), относительно нормы и больных имела место только в группе родственников до 43 лет, т.е. не прошедших возраст риска развития заболевания. Таких был 71%, против 58% в норме и 60% среди больных (односторонний критерий, $p=0,05$ и $p=0,10$). Возможно, это

объясняется более поздним началом болезни у лиц с генетическим предрасположением и высокими когнитивными резервами. Более ярко различия проявились в связи с когнитивным дефицитом. Имело место значимое накопление носителей аллеля G среди больных без когнитивного дефицита относительно нормы и прочих больных (83% против 59% в норме и 58% у больных с когнитивным дефицитом, $p=0,01$ и $p=0,02$). Следует также отметить, что полиморфизм SNAP25 вносил вклад в вариативность когнитивных функций у здоровых неотягощенных лиц ($n=141$, $p=0,01$).

В целом эти данные согласуются с предположением о роли гена SNAP25 в обеспечении когнитивными резервами, действующими при наличии патологического мозгового процесса и смягчающими его проявления на уровне когнитивного функционирования.

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СОЗНАНИЕ В ЛОГИКЕ ПОЗНАНИЯ

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1. Как радикальный когнитивист, исхожу из убеждения: все психические явления, включая сознание, обеспечиваются нейрофизиологическими механизмами, но не могут ими объясняться. Поиск объяснения возможен только в логике познания. Поэтому предлагаю рассматривать человека как идеальную познающую систему, не имеющую никаких ограничений на возможности приёма, хранения и переработки информации. Введенная идеализация предполагает, что логика познавательной деятельности сама по себе накладывает ограничения на информационные преобразования в психике и сознании и что эти ограничения настолько мощнее физических или физиологических, что последними можно пренебречь.

2. Очевидно, что знания как результат познания могут зависеть и от познаваемой реальности, и от познающей системы. Оценивая эффективность познания, необходимо специально проверять, что полученные знания имеют отношение к тому, что познается, а не определены особенностями работы самой познающей системы. В философии науки выделяют три способа такой проверки: проверка всей совокупности знаний на внутреннюю согласованность (непротиворечивость); независимая проверка знаний, сопоставляющая результаты познания,

полученные принципиально разными, не связанными друг от друга способами; проверка на интерсубъективность, когда знание, полученное одним человеком, сообщается другим людям, предоставляя им возможность проверить это знание в своей деятельности.

3. Наука – высшая форма познания. По этому образцу можно предполагать, что человек как идеальная познающая система должен использовать такие же принципы проверки. Обязательно должны существовать принципиально разные, не связанные между собой пути познания реальности. Каждый такой путь должен опираться на свою специфическую информацию, свой способ генерации гипотез, свою собственную проверку этих гипотез и т.д. Человек как идеальная познающая система также необходимо должен создать социальный контур проверки своих знаний (поэтому возникновение социального – необходимое следствие когнитивной деятельности). И вся совокупность знаний должна постоянно проверяться на внутреннюю согласованность.

4. Сказанное задает структурообразующий принцип описания познавательной деятельности. Должно существовать множество параллельных схем познания. Однако результат работы этих схем не может быть сопоставлен непосредственно: они выполнены на разных языках. Как, например, сличать сенсорные и моторные образы? Появляются уровни познания, пытающиеся создать правила перевода с одного языка (например, сенсорного) на другой язык

(например, моторный). Но сами эти правила тоже нужно независимо проверять. Так последовательно появляется социальный контур проверки, затем языковой и т.д.

5. О результатах сличения необходимо как-то сообщать другим уровням познания. И такое сообщение может быть только качественным (верно – неверно), иначе теряется независимость работы познавательных контуров друг от друга. По-видимому, эту функцию выполняют эмоциональные сигналы. Такие сигналы, тем самым, выступают для самой познающей системы как критерии эффективности ее работы.

6. Идеальная познающая система – это самоорганизующаяся система, которая автоматически настраивается на заданные критерии эффективности. Так создается дополнительный контур независимой проверки. В силу неопределенности обычно употребляемых терминов его можно назвать психикой, когнитивным бессознательным (ранее я даже называл его механизмом сознания). Этот контур не получает непосредственно никакой информации от внешнего мира и питается лишь эмоциональными сигналами.

7. Психика обладает возможностью воздействовать на любые структуры организма (как на познавательные, так и жизнеобеспечивающие, ведь жизнь является необходимым условием познания). И пробует разные способы воздействия, чтобы получить эмоциональное подкрепление. Она не отражает, а конструирует мир, но не оторвана от мира, поскольку проверяет свои конструкции. Воздействуя на различные познавательные структуры, она пытается получить подтверждающие эмоциональные сигналы. И постепенно научается более-менее адекватно управлять организмом и вызывать субъективные переживания, переводя их в описание реального мира.

8. Наконец, на высшем уровне познания (сознательном) все созданные познающей системой конструкты проходят проверку на согласованность. Поскольку субъективные переживания входят в полное описание мира, то описание мира осознается одновременно с его представленностью на сенсорном, сенсомоторном, вербальном языке. Этот высший уровень познания способен корректировать любые представления. То, что человек осознает, становится реальностью, управляющей его поведением. Можно сформулировать и экспериментально проверить серию законов, описывающих работу сознания.

9. Сознание строит идеализированные объекты, а такие объекты никогда не могут быть

построены в результате эмпирического наблюдения, оно способно отождествлять нетождественное и различать неразличимое. Поскольку сознание работает с идеальными конструктами, то оно, разумеется, менее полно и точно описывает то, что известно на других уровнях познания. Сознание ведет себя так, как будто пытается угадать правила игры, по которым «играет» природа, а затем организует деятельность по проверке своих догадок и зачастую – подгонке реальности к ним. Угадывая, сознание как бы исходит из того, что природа действует по заранее заданным правилам, т.е. что в мире все регулярно и взаимосвязано, все наполнено смыслами.

10. Серия экспериментальных исследований, проведенных мною и моими сотрудниками, позволяет проверить несколько следствий из предложенной структуры познавательной деятельности. В частности, показано, что сознание защищает свои действия от опровержения, например, имеет тенденцию повторять свои ошибки. А в процессе научения обучается сознание, а не организм (вопреки позиции бихевиористов): так, уже в начале процесса научения человек повторяет свои ошибки с точностью, превосходящей ту точность решения задач, которую он демонстрирует в конце процесса научения.

11. То, что находится в сознании, постоянно сличается с тем, что не осознано. Сознание получает только качественную оценку соответствия – эмоциональный сигнал. Сам этот сигнал не является специфичным для конкретной задачи, он в принципе сообщает о соответствии неких сознательных идей и неосознанных результатов. Получив такой сигнал, сознание не всегда знает, о решении какой именно задачи сообщается. Моими учениками было показано: нахождение решения одной задачи (т.е. появление сигнала «задача решена») может ускорять решение другой задачи, никак не связанной с первой.

12. Как известно, сознание течет непрерывным потоком, никогда не останавливаясь. Поэтому, например, неизменная стимуляция ускользает из сознания или трансформируется. Однажды уже установленное соответствие осознанных идей с этой стимуляцией далее перестает давать сигнал о соответствии, а потому перестает осознаваться.

13. Сознание не является рабом собственного мозга. Рассмотрим дилемму: любое действие рассматривается сознанием как детерминированное, а свободное действие – это действие, по определению, ничем не детерминированное. Как же возможно совершение сознанием свободного действия? Предложенный подход позволяет

найти решение. Когда сознание ставит перед собой вопрос о собственной свободе, оно способно совершить действие, которое в данный момент с точки зрения сознания ничем не детерминировано. Точнее: оно способно совершить действие, которое детерминировано только тем, что оно

для самого сознания ничем не детерминировано. Другое дело, что, совершив свободное действие, сознание *a posteriori* приписывает ему причину.

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ИМПЛИЦИТНОЕ ДОВЕРИЕ КАК КОГНИТИВНЫЙ ПРОЦЕСС

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С каждым годом исследований, посвященных доверию, становится все больше и больше. Однако большинство ученых рассматривает доверие как социальный феномен и поэтому изучает доверие с прикладных точек зрения. Так, большинство зарубежных исследований посвящено доверию в экономических взаимоотношениях, рекламе, организации. Несмотря на важность прикладных исследований, редко встречаются работы, направленные на изучение фундаментального феномена доверия. Пожалуй, наиболее полный анализ таких исследований в отечественной и зарубежной литературе можно встретить в работе А.Б. Купрейченко «Психология доверия и недоверия» (2008).

Можно выделить 3 основные темы, обсуждаемые в рамках изучения доверия.

1) Определение доверия. Сложность исследований доверия связана в основном с тем, что ученые по-разному понимают данный феномен. В работах отечественных и зарубежных психологов можно выделить 4 основных представления о доверии: доверие как ожидание, доверие как оценка, доверие как поведение и доверие как отношение. Гудж и Гилсон (Goudge, Gilson, 2005) в своей статье утверждают, что определение доверия подвержено влиянию контекста (в широком смысле этого слова). По мнению ученых, в разных социальных ситуациях доверие несет разный смысл, и поэтому множится количество определений. Например, специально для доверия между родителями и учителями (семьей и школой) Адамс и Кристенсон (Adams, Christenson, 2000) определяют доверие как уверенность в том, что другой человек будет поддерживать и развивать, обогащать отношения между семьей и школой, чтобы достичь позитивных результатов для обучающегося. 2) Ученые, исследующие феномен доверия, расходятся в точке зрения на процессы доверия и недоверия. Одна группа ученых считает недоверие

антонимом доверия. Другими словами, если доверие определяется как уверенное ожидание позитивного исхода, то недоверие – ожидание негативного исхода. В данном случае, доверие-недоверие – это дихотомия, и относительного каждого объекта, элемента человек может быть где-то на отрезке между этими двумя полюсами. В противоположность такой точке зрения Купрейченко, вслед за Б.Ф. Поршневым и другими учеными, предлагает считать доверие и недоверие двумя самостоятельными процессами. При таком взгляде доверие рассматривается как интерес и уважение к партнеру, представление о потребностях, которые могут быть удовлетворены в результате взаимодействия с ним, а также положительная эмоциональная окраска этого взаимодействия. Недоверие же представляется как осознание рисков, чувство опасности, страха в сочетании с негативными эмоциональными оценками. В данной модели доверие и недоверие – это уже две шкалы, по которым оценивается каждый объект, партнер и т.п. Человек одновременно может испытывать доверие и недоверие к окружающим его людям или явлениям.

3) Эксплицитное и имплицитное доверие. Ученые говорят о том, что есть осознаваемое и неосознаваемое доверие. Первое исследуется с помощью опросников, интервью, тестов и других социально-психологических методик, так как наиболее часто речь идет о доверии в социальном взаимодействии: в трудовом коллективе, среди друзей и родственников.

В своей работе я рассматриваю имплицитное доверие как общепсихологический феномен. Исходя из когнитивного подхода, который говорит, что человек – это ученый, и основная его функция – это познание, возникает следующий вопрос: как функция доверия помогает нам познавать мир? Какую неосознаваемую информацию несет в себе доверие или недоверие к тем или иным объектам, явлениям, ситуациям? Основываясь на проведенном теоретическом анализе, предлагается следующая модель имплицитной теории доверия.

Она состоит из двух компонентов: имплицитное ожидание успешности или неуспешности и имплицитная потребность в проверке правильности или отсутствия такой потребности. Таким образом, мы предполагаем, что возможны 4 варианта имплицитной теории доверия: ожидание успешности (ОУ)/потребность в проверке (ПП), ОУ/отсутствие потребности в проверке (ОПП), ожидание неуспешности (ОН)/ПП, ОН/ОПП. Естественно, что это крайние полюса предлагаемой системы координат. Но в реальной жизни мы можем наблюдать различие в поведении одного и того же человека в зависимости от ситуации. Ученые, исследующие индивидуальные различия личности в разных ситуациях, обнаружили, что, несмотря на разницу в поведении, оно подчиняется определенному паттерну «если..., то...» (Church et al., 2010, Moskowitz, 2009, Smith et al., 2009 и др.). Такой профиль взаимосвязи между ситуацией и поведением стали называть «личностным поведенческим почерком» (behavioral signature of personality) (Mischel, 2004). Однако, несмотря на вариативность поведения в различных ситуациях, для каждой черты различие сохраняется в некотором пределе изменений для данной черты. Поэтому разнообразие поведения может объясняться функциональной зависимостью имплицитной теории доверия от ситуации. Другими словами, имплицитная теория доверия имеет вид функции, где каждой конкретной ситуации (допустим, ось X) соответствует только один тип доверия, расположенный в плоскости на осях (ОУ-ОН и ПП-ОПП).

Таким образом, перед исследователями имплицитной теории доверия встает сложный вопрос, как выявить тенденциозную направленность человека к тому или иному типу. Типичная имплицитная теория доверия должна проявиться у человека в тот момент, когда он

сталкивается с новой ситуацией или объектом. В этом случае до формирования частной имплицитной теории применяется как раз стереотипическая оценка ситуации по более близкому внутреннему паттерну.

На данный момент группой исследователей проводится пилотный эксперимент, в котором проверяется формирование доверия к определенным объектам в простой моторной задаче. Испытуемые должны быстрее определенного времени успеть перевести мышку из одного кружка (слева) в другой кружок (справа). Правые кружки отличаются по цвету. Перед каждой парой кружков, испытуемым предъявляется либо «успешный» (+), либо «неуспешный» (-) прайминг (испытуемые в процессе тренировочной серии научаются понимать, что значат + и -). Точно такой же прайминг предъявляется после выполнения задания с конкретной парой. При этом данный прайминг не зависит от того, насколько реально успешно справился человек с заданием. Наша гипотеза заключается в предположении, что испытуемый будет более удобно себя чувствовать в какой-то конкретной ситуации, и, следовательно, следующее задание после внутренне комфортного он будет выполнять быстрее. В дальнейшем данные типологии, полученные на простом моторном уровне и социальном уровне, планируется сравнить с результатами, которые испытуемые будут показывать в эксперименте на уровне социального взаимодействия. Таким образом, мы надеемся показать, что у человека существует определенная типичная имплицитная теория, которая проявляется в том случае, когда человек сталкивается с новой ситуацией. На основе этой теории человек принимает решения, как на уровне простых когнитивных действий, на социальном уровне и на уровне принятия важных жизненных решений.

КОГНИТИВНЫЕ УСТАНОВКИ В КОНФЛИКТЕ

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Обычно считается, что конфликт — это следствие врожденной агрессивности и враждебности людей, их стремления любой ценой, силой или обманом, добиться удовлетворения своих интересов. Такие когнитивные установки проявляются в типичных высказываниях участников конфликтов: «людям доверять нельзя, тем более

в конфликтной ситуации», «пойти на переговоры — показать свою слабость», «чтобы добиться своего, надо использовать давление и силу», «надо ловко манипулировать оппонентом», «за обиду надо наказывать». Подобные когнитивные установки реализуются в агрессивных и манипулятивных формах коммуникации и не могут урегулировать конфликт, что можно видеть в нашей повседневной жизни как в межличностных конфликтах, так и в любых других: бытовых, экономических, политических и т. д.

Высказывания помощника \ Ответы испытуемых	Агрессивные ответы	Манипулятивные ответы	Пассивные, нейтральные ответы	Конструктивные ответы
Агрессивные	39%	42%	9%	10%
Манипулятивные	30%	43%	11%	22%
Пассивные	22%	40%	22%	16%
Конструктивные	17%	14%	10%	59%

Таблица 1. Частота реакций респондентов.

Однако любой конфликт может быть успешно разрешен, если исходить из других когнитивных установок: «Конфликт между людьми является естественной формой развития и разрешения противоречий, а не проявлением исходной враждебности. Каждая из сторон имеет свои интересы, которые затрагивают интересы другой стороны. Только учет интересов всех сторон и совместное нахождение рационального выхода из сложившейся ситуации может привести к реальному разрешению конфликта». Обеспечить такой подход может специально организованная конструктивная форма коммуникации между участниками конфликта. Практика работы с конфликтами на самом деле показывает, что при правильной форме коммуникации конфликт будет урегулирован.

Гипотеза: Агрессивная или манипулятивная форма коммуникации в конфликте никогда не приводит к реальному разрешению конфликта. Только конструктивная коммуникация (диалог) может приводить к урегулированию конфликта.

Нами было проведено исследование по изучению влияния когнитивных установок на способ коммуникации при разрешении конфликтной ситуации. Испытуемыми были студенты и аспиранты СПбГУ. Каждому испытуемому предлагалась парная ролевая игра с помощником экспериментатора, в которой был ущемлен интерес испытуемого. Ему предлагалось «урегулировать конфликт любым способом, каким он обычно это делает». Моделировалась одна и та же ситуация, в которой помощник экспериментатора вел себя в процессе взаимодействия, используя одну из четырех форм коммуникации: агрессивную, манипулятивную, пассивную или конструктивную. Далее осуществлялся анализ видеозаписей, где группа экспертов (7 психологов) оценивала ответные формы коммуникации по тем же 4 категориям.

Под **агрессивной** формой коммуникации понимались высказывания, направленные на отказ выполнить какие-либо просьбы испытуемого в резкой форме, давалась прямая негативная оценка личности, оказывалось давление, испытуемого перебивали и т. п. Под **манипулятивной** формой поведения понимались высказывания, не

связанные с решением проблемы, делались намеки, что в сложившейся ситуации испытуемый сам виноват, оказывалось давление путем морализирования, указание на некомпетентность и т. д. В отличие от агрессивных высказываний, при манипуляции это делалось спокойно, иногда с ироничной улыбкой. Под **пассивной** формой коммуникации понимались высказывания, направленные на уход от обсуждения: указание на то, что сейчас не время для решения проблемы, молчание в ответ на высказывания и действия испытуемого. Под **конструктивной** формой коммуникации понимались высказывания, направленные на поиск решения проблемы: готовность выслушать, высказывания типа: «что еще возможно сделать в сложившейся ситуации?» и т. п. Использовались также конструктивные техники вербализации.

Кроме того, на всех участников эксперимента были получены тестовые данные об их стиле поведения (методика Томаса-Килманна), агрессивности (Hand-Тест), уровне тревожности (шкала Тейлор), ценностных ориентациях (методика Рокича). После эксперимента также осуществлялось интервьюирование об эмоциональном состоянии участника.

Подсчитывалось общее количество высказываний, относящихся к каждой из 4 форм коммуникации, и оценивался конечный результат по разрешению конфликта. Экспертами также оценивалась эмоциональная составляющая высказываний и анализировалось невербальное поведение: агрессивная или нейтральная поза, поза сотрудничества, наличие или отсутствие напряжения.

Результаты показали, что при агрессивных и манипулятивных формах коммуникации конфликт не разрешается. При пассивной форме коммуникации снижается эмоциональное напряжение, но конфликт не разрешается. И только при конструктивной коммуникации все 10 конфликтов были успешно урегулированы.

В таблице приведена частота появления коммуникативных ответов респондентов в зависимости от формы высказывания помощника экспериментатора.

Результаты эксперимента показывают, что конструктивное высказывание можно получить

в ответ на конструктивное высказывание более, чем в три раза чаще, чем в других случаях ($p < 0,001$). Как агрессия, так и манипуляция не способствуют возникновению конструктивного поведения. На агрессивное и манипулятивное поведение обнаруживается более высокий процент ответных агрессивных и манипулятивных реакций ($p < 0,01$). Наиболее частыми были реакции манипулятивного типа. Возможно, это связано с тем, что эксперимент проводился со студентами и аспирантами, и подтверждает когнитивную установку участников, что манипуляция – наиболее эффективная форма удовлетворения своих интересов за счет противоположенной стороны с

минимальными затратами для себя. Пассивные (нейтральные) высказывания, поскольку они не изменяли ситуацию взаимодействия, также воспринимались как манипулятивные.

Показательно, что все индивидуально-психологические характеристики, измеренные по указанным тестам, не дали связей ни с одним из типов коммуникации в моделируемом конфликте. Таким образом, результат общения людей зависит преимущественно от формы коммуникации между ними, а не от индивидуально-психологических особенностей личности или специфики конфликтной ситуации.

МАКРОСТРУКТУРА АВТОБИОГРАФИЧЕСКОЙ ПАМЯТИ: ОДНОРОДНОЕ, ТИПИЧНОЕ, СЦЕНАРНОЕ – НАБЛЮДАЕТСЯ ЛИ ПРЕИМУЩЕСТВО ПРИ ВОСПРОИЗВЕДЕНИИ?

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Ещё в начале XX века представителями школы гештальтпсихологии было показано влияние общей структуры воспринимаемого материала на эффективность запоминания его элементов. Например, эффект фон Ресторф заключается в том, что независимо от характера материала, если в ряду разнородные элементы перемежаются с большим количеством однородных, то эти разнородные элементы обладают преимуществом при воспроизведении. Отметим, что фон Ресторф понимала параметр разнородности ситуативно. В дальнейшем была продемонстрирована высокая устойчивость данного эффекта, а понятие разнородности, дистинктивности (*distinctiveness*) расширено за счет включения фактора частотности семантической категории, а также предложено несколько моделей для его объяснения (обзор: Schmidt, 1991).

Однако в последнее время был получен ряд данных, ставящих под сомнение универсальность эффекта дистинктивности. В частности, эмпирические результаты исследований воспоминаний о личностно значимых событиях свидетельствуют о том, что содержание автобиографических историй весьма однородно (Bertsen, Rubin, 2004). По нашему мнению, подобные результаты связаны с тем, что в автобиографической памяти существенный вклад в феноменологию воспроизведения делают как минимум три фактора: 1) однородность воспоминания в цепи индивидуальных жизненных событий, 2)

типичность события для данной социальной общности, 3) сценарность, т.е. соответствие разделяемым большинством членов общества представлениям о типичном содержании и описании событий, а также приписываемой им значимости и валентности. Показано, что автобиографическая информация, соответствующая содержанию культурного жизненного сценария (и в этом смысле ординарная, стандартная), при фиксации и извлечении обладает преимуществом по сравнению с несценарной информацией (Алюшева, 2011).

Чтобы исследовать, какой эпизод прошлого является типичным или нетипичным, было проанализировано 386 протоколов – результатов методики «Линия жизни» (автор – В.В. Нуркова), направленной на выявление структурно-содержательных характеристик автобиографической памяти. Выявлен рейтинг частотности жизненных событий, включаемых в воспоминания респондентов. Далее проведено сопоставление наиболее частотных, типичных событий (начало и окончание учёбы в школе, поступление в вуз, брак, рождение детей и т.д.) с представлениями о культурном жизненном сценарии в данном социуме (методика Д. Бертсен, Д. Рубина). Выявлен значимый уровень конгруэнтности в воспроизведении двух типов данных.

Мы предполагаем, что сценарий является средством оформления индивидуальной макроструктуры автобиографической памяти. Представления о том, когда и какие события произойдут, совпадают с реальными воспоминаниями о своей жизни. Можно предположить, что субъект заранее ожидает наступление того

или иного события, что повышает вероятность фиксации, сохранения и воспроизведения данного автобиографического материала. Соответственно, посредством усвоения культурного жизненного сценария происходит развитие автобиографической памяти, выражающееся в социальной схематизации личностно значимых воспоминаний. Однако далее в становлении данной мнемической подсистемы происходит индивидуализация социальной траектории развития.

На следующем этапе исследования мы поставили вопрос о том, как усвоение семейного сценария связано с характеристиками автобиографической памяти респондентов. Проводилось сопоставление методики «Линия жизни», заполненных респондентами вместо своих родителей и заполненных самими родителями, анализировались совпадения и расхождения в воспоминаниях, что рассматривалось как критерий представленности прошлого родителя в памяти респондента, т.е. степень усвоения семейного жизненного сценария. Эмпирически показано, что чем больше событий жизни родителей вспоминает респондент, тем более содержательно наполнена его собственная автобиографическая память – воспоминания относятся к различным жизненным темам ($r=0,623$, $p<0,05$), отмечается больше оригинальных, несценарных воспоминаний ($r=0,636$, $p<0,05$). Количество совпадений отмеченных событий на «Линии жизни» самими родителями и на «Линии жизни» родителей в представлении респондентов значимо положительно коррелирует с полифункциональностью их автобиографической памяти ($r=0,614$, $p<0,05$). Соответственно, чем лучше респондент представляет себе прошлое родителя, тем более гибкий и вариативный его собственный репертуар функций памяти о себе.

Усвоение типичной схемы организации жизненных событий (методика Д. Бертсен, Д. Рубина) связано с уровнем развития автобиографической памяти, который характеризуется доступностью прошлого опыта (количество воспоминаний, отмеченных на «Линии жизни», $r=0,613$, $p<0,01$), тематическим разнообразием воспоминаний ($r=0,568$, $p<0,05$), наличием необычных, несценарных воспоминаний ($r=0,659$, $p<0,01$). Последняя взаимосвязь является, по нашему мнению, наиболее интересной для дальнейшего исследования, т.к. типичный сценарий – это представления о том, как обычно складывается жизнь в данной общности. Получается, чем лучше субъект представляет себе типичную жизнь, тем больше воспроизводит уникальных воспоминаний о своей жизни.

Таким образом, эмпирически выявлена значимая положительная связь между степенью овладения внешним культурным и семейным жизненным сценарием и уровнем развития автобиографической памяти. Респонденты чаще воспроизводят сценарные события, воспоминания о личностно значимых эпизодах прошлого. Согласно полученным данным, сценарность как фактор развития автобиографической памяти нарушает универсальность эффекта дистинктивности: респонденты вспоминают больше сценарных и типичных событий (например, свадьба), меньшей частотностью обладают несценарные, но типичные события (например, развод), и наиболее редко воспроизводятся несценарные, нетипичные события (например, полёт на дельтаплане).

Важно отметить, что развитая автобиографическая память включает в себя сбалансированные представления о сценарных, типичных и уникальных событиях жизни, сценарность и несценарность автобиографического материала – не оппозиция.

В культуре существуют образцы приемлемых, поощряемых построений воспоминаний о личном прошлом. Однако субъект не просто присваивает готовые «форматы» воспоминаний, но дополняет, личностно прорабатывает их. В итоге, по нашему мнению, макроструктура развитой автобиографической памяти представляет собой конфигурацию воспоминаний разной степени однородности. Вспоминая личное прошлое, респонденты с оптимальной макроструктурой автобиографической памяти обращаются преимущественно к сценарным воспоминаниям, но также включают в воспроизведение и нетипичные, уникальные эпизоды. В свою очередь, преобладание только одного из типов воспоминаний, по нашему мнению, является признаком неразвитой формы организации автобиографической памяти.

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ЭФФЕКТ КАТЕГОРИАЛЬНОСТИ ПРИ ВОСПРИЯТИИ ЛИЦ РУССКИХ И ТУВИНЦЕВ

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В психологии зрительного восприятия эффект другой расы имеет четко выраженный социальный аспект, а практическая значимость этой проблемы определяется многонациональностью большинства современных локусов совместного проживания людей. Как показано в работах отечественных и зарубежных психологов, чрезвычайно важным в восприятии, узнавании и оценке человека является его расовая принадлежность.

В кросс-культурном исследовании изучалось проявление эффекта категориальности при восприятии лиц европейцев и азиатов испытуемыми-тувинцами

Испытуемые: В исследовании приняли участие 64 студента Тувинского государственного университета в возрасте от 18 до 25 лет. Из них около 40% мужчин и 60% женщин. Каждый испытуемый принимал участие в решении дискриминационной АВХ-задачи. 34 человека приняли участие в серии, где в качестве стимулов использовались изображения мужских лиц, 30 человек - в серии с предъявлением женских лиц.

Процедура исследования: испытуемым демонстрировали цветные фотоизображения реальных лиц, а также построенные с помощью техники морфинга переходные ряды между лицами двух расовых групп (среднеевропейской и центральноазиатской). Каждый ряд включал два опорных фотоизображения (реальные лица), относящихся к разным расам, и четыре промежуточных (морфированные лица). Пример

стимульного материала представлен на рисунке 1.

Каждое исследование включало две тренировочные серии (время предъявления фотоизображений – 1.5 с., 1 с., шумовой маски – 1.125 с., 0.75 с. соответственно) и шести основных (внутрикатегориальные пары и межкатегорические пары). Время предъявления фотоизображений в основных сериях составляло 1 с., шумовой маски – 0.75 с. Объем тренировочных серий включал 20 экспозиций (5 пар в 4-х вариантах каждая), основных серий – 40 экспозиций (5 пар в 4-х вариантах каждая, двукратный повтор). Угловые размеры изображений при расстоянии до экрана 50 см составляли $7^\circ \times 9^\circ$.

После каждой экспозиции испытуемый должен был, используя правую цифровую клавиатуру, указать, какому из двух дистракторов соответствовало целевое изображение: левому (1) или правому (2). Ввод ответов подтверждался нажатием клавиши «0», очередная проба запускалась клавишей «пробел».

По результатам эксперимента для каждого испытуемого рассчитывалась точность решения дискриминационной задачи в зависимости от серии (2 тренировочных, 6 основных), номера пары переходного ряда (от 1 до 5).

Для выборки в целом проводилась проверка наличия зависимости точности решения дискриминационной задачи от номера пары в переходном ряду. Анализ выполнялся по отдельности для каждой из основных серий (лица мужчин и лица женщин). При проверке гипотезы о наличии зависимости точности решения от номера пары использовался критерий χ^2 .

Результаты основных серий. Наличие эффекта категориальности было зафиксировано для внутрикатегориальных рядов лиц тувинцев-мужчин (Pearson Chi-square = 31.499, $p < 0.001$) и тувинцев-женщин (Pearson Chi-square = 15.734, $p = 0.003$), а также всех межкатегорических рядов лиц мужчин (Pearson Chi-square



Рис. 1. Пример стимульного материала (серия «Лица женщин», межкатегорический ряд изображений).



Рис. 2: Изображения лиц, на которых был получен эффект категориальности подтвердившийся формулой Либермана-Кальдера.

= 68.376, $p < 0.001$; Pearson Chi-square = 60.721, $p < 0.001$; Pearson Chi-square = 95.876, $p < 0.001$; Pearson Chi-square = 45.295, $p < 0.001$) и трех межкатегориальных рядов лиц женщин (Pearson Chi-square = 28.668, $p < 0.001$; Pearson Chi-square = 50.086, $p < 0.001$; Pearson Chi-square = 34.920, $p < 0.001$).

Чтобы убедиться, что при распознавании лиц испытуемые ориентируются именно на расовый тип лица, а не на какие-либо другие особенности, например, на естественность/искусственность изображения, была проведена дополнительная серия экспериментов. Некоторым испытуемым (в случайном порядке было отобрано 30 испытуемых) предлагалось ознакомиться с 36 фотоизображениями, использованными в дискриминационной АВХ-задаче, и выполнить задачу идентификации. Требовалось расклассифицировать тест-объекты на две группы: представителей «русского» и «тувинского» расовых типов. Определялась частота попадания каждого фотоизображения в одну из групп.

В вычислениях использовалась формула Либермана-Кальдера (Calder, 1996):

$$P_c = ((P_I + P_r) / 2) + 0.25 \times (P_a - P_b), \text{ где}$$

P_c – доля правильных идентификаций;

P_I – эффективность решения задачи для первой пары ряда;

P_r – эффективность решения задачи для последней пары ряда;

P_a – идентификация изображения как А;

P_b – идентификация изображения как В.

Расчет по формуле проводился для каждой пары переходного ряда (отдельно по каждой серии), что позволило сформировать теоретическое распределение точности выполнения АВХ-задачи. Сопоставление теоретического распределения и эмпирических данных осуществлялось с помощью коэффициента корреляции Спирмена. Подтверждение эффекта категориальности восприятия для межкатегориальных рядов лиц было получено в одном случае для мужских и женских лиц (см. рис.2).

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ЧЕЛОВЕК – ДВИЖУЩАЯСЯ СИСТЕМА ОТСЧЕТА?

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В активном состоянии человек преимущественно находится в движении, и поэтому ориентация в окружающей среде часто происходит

в движении. Возникает вопрос о том, как в случае собственного движения происходит оценка человеком движущихся объектов среды. Для сенсорных систем, выполняющих задачу ориентации в пространстве, характерно явление последействия движения стимула. Последействие можно рассматривать как временные адаптивные изменения функции сенсорной системы, способствующие правильной оценке движения

стимулов с учетом собственного движения человека. Последствие движения проявляется в том, что после продолжительного воздействия адаптирующими стимулами, движущимися в одном направлении, неподвижный тестовый сигнал воспринимается испытуемыми как движущийся в направлении, противоположном направлению движения адаптирующих стимулов. Медленно движущийся в направлении адаптирующих стимулов тестовый сигнал оценивается испытуемыми как неподвижный. Последствие движения давно известно и подробно исследовано для зрительной системы. Показано последствие для слуховой системы (Grantham, Wightman, 1979) и для тактильной чувствительности (Hollins, Favorov, 1994). В последние годы обнаружено межсенсорное взаимодействие последствие движения: при адаптации к движению стимула одной модальности возникает изменение восприятия пространственного положения и движения стимула другой модальности (Deas et al., 2008; Konkle et al., 2009). Анализ литературных данных о последствии движения позволяет выделить два относительно самостоятельных уровня адаптации к движению при ориентации в пространстве. Первый уровень – сенсорный. Последствие, которое формируется на сенсорном уровне, характеризуется тем, что возникает при кратковременной адаптации, продолжается в течение нескольких секунд и быстро угасает. Второй уровень – интегративный, он включает процессы, происходящие за пределами конкретной сенсорной системы. Это последствие, которое возникает после нескольких минут адаптации, длится в течение сопоставимого с продолжительностью адаптации времени и медленно угасает. Упомянутое выше межсенсорное взаимодействие наблюдалось при продолжительной стимуляции и, по-видимому, имеет отношение ко второму уровню. Перечисленные факты, связанные с последствием движения, позволяют предположить, что существует общая система сенсорной адаптации к движению. Ее проявления можно рассмотреть на примере слуховой адаптации, исследуемой нами.

Особенности проявления слухового последствие зависят от ряда условий адаптации к движению, прежде всего от ее длительности. При кратковременном воздействии к движению наблюдали выраженное последствие движения, отличающееся по ряду параметров от последствие при длительной адаптации (Dong et al., 2000; Neelon, Jenison, 2004; Deas et al., 2008; Андреева, Малинина, 2010; 2011). Вместе с тем при обоих видах адаптации

выявлена пространственная настройка эффекта последствие. Величина последствие движения источника звука оказалась больше, когда тестируемая область пространства совпадает с траекторией адаптирующего стимула и значительно уменьшается в условиях, когда тестовый стимул движется вне области адаптирующего стимула (Dong et al., 2000; Neelon, Jenison, 2004; Малинина, Андреева, 2011). Частотная избирательность слухового последствие также наблюдалась при разной длительности адаптации (Grantham, 1979, 1989; наши данные). Наблюдали значительные различия величины эффекта от частоты звука и от совпадения или отличия спектрального состава адаптирующего и тестового стимула. При не совпадающем спектральном составе адаптирующего и тестового стимула слуховое последствие значительно уменьшалось по величине по сравнению со случаем совпадающих по спектру стимулов. При совпадении спектрального состава адаптирующего и тестового стимулов минимальное последствие получили в спектральной области 2-4 кГц (Dong et al., 2000; наши данные), в которой бинауральные механизмы локализации по азимуту на основе междушумных различий по времени и интенсивности работают недостаточно эффективно. Низкочастотные тональные (Grantham, 1989) и полосовые шумовые (Dong et al., 2000) стимулы вызывали большее последствие движения, чем высокочастотные. Рассмотренные особенности слухового последствие движения указывают на то, что коррекция оценки движения объекта с учетом собственного движения имеет в своей основе изменение функционального состояния нервных структур, участвующих в анализе движения, и происходит, по-видимому, неосознанно.

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ДВИЖЕНИЯ ГЛАЗ ПРИ ЧТЕНИИ ПРЕДЛОЖЕНИЙ С СИНТАКСИЧЕСКОЙ НЕОДНОЗНАЧНОСТЬЮ В РУССКОМ ЯЗЫКЕ

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Параметры движений глаз (длительности фиксации, амплитуды саккад, количество регрессивных саккад) используют для оценки когнитивных процессов во время чтения (Rayner, 1998). Мы разработали новый подход для анализа разрешения синтаксической неоднозначности при чтении предложений, содержащих неоднозначность вида «неопределённость придаточного предложения женского рода» (например, «Преступник застрелил служанку актрисы, которая стояла на балконе» vs. «Преступник застрелил слугу актрисы, которая стояла на балконе»).

В экспериментах испытуемые (18 студентов) читали 40 предложений с неоднозначностью (тестовые, ТП) и 40 контрольных предложений (КП), не содержащих смысловых противоречий. ТП и КП предъявляли в случайной последовательности. После прочтения предложения (см. пример с неоднозначностью) испытуемым на экране предъявляли контрольный вопрос (например, «Кто стоял на балконе?»). Варианты ответов к предложениям (два дополнения, например, «служанка» и «актриса») располагали на экране монитора случайно справа и слева. Для верификации результата разрешения неоднозначности (при ответе на контрольный вопрос)

испытуемых инструктировали зафиксировать взор на выбранном слове. Предложения предъявляли на экране монитора, располагаемом в 45 см от глаз испытуемых. Вторая строка с неоднозначностью (в ТП, рис. 1) и без оной (в КП) состояла из 25–27 символов. Длина всех трех строк ТП и КП составляла 38 см. Координаты взора регистрировали с использованием оригинального видеоокулографа с частотой 250 Гц. Испытуемые участвовали в эксперименте только один раз.

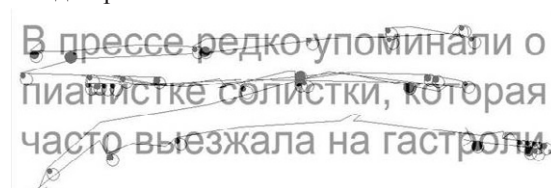


Рис. 1. Пример предложения с синтаксической неоднозначностью. Кружками отмечены фиксации. Их длительности пропорциональны диаметру кружков.

Анализировали различия ряда параметров движений глаз при чтении второй строки ТП и КП: (1) время чтения, (2) число фиксаций, (3) число возвратных саккад и (4) продолжительность фиксаций. Эти параметры представляют собой объективные маркеры, отражающие когнитивные процессы при разрешении синтаксической неоднозначности при чтении. Получены достоверные отличия между всеми параметрами (табл. 1).

Параметр	ТП	КП	Уровень значимости, <i>p</i>
Время чтения (мс)	1533	1304	<0,00001
Число фиксаций	5,8	5,1	<0,01
Частота регрессивных саккад (на строку)	0,75	0,36	<0,01
Длительность фиксаций (мс)	211	203	<0,03

Таблица 1. Параметры движений глаз при чтении 2-й строки в ТП и КП. Данные усреднены по всем предъявлениям и по всем испытуемым. Влияние фактора «неоднозначность» на все параметры (с соответствующим уровнем значимости *p*) оценивали методом дисперсионного факторного анализа.

Время чтения 2-й строки ТП было на 18% больше, чем аналогичное время при чтении КП. Этот параметр является интегральным и включает в себя число фиксаций и их длительность. Выполнение регрессивных саккад при повторном чтении приводит к увеличению числа фиксаций. По результатам аналогичных исследований в различных языках (Rayner, 1998), регрессивные саккады возникают в момент оценки рассогласования смысла в предложении. Это положение подтверждается высокой частотой регрессивных саккад при чтении ТП в наших экспериментах.

Длительность фиксаций увеличивается при чтении ТП, свидетельствуя о замедлении восприятия и анализа текстовых фрагментов, содержащих синтаксическую сложность. Увеличение всех исследованных параметров при чтении 2-й строки ТП свидетельствует о затруднениях при интерпретации смысла предложений, т. е. параметры движений глаз являются своеобразными маркерами процесса разрешения синтаксической неоднозначности.

Сложность при разрешении синтаксической неоднозначности проявлялась также и при выборе ответа после прочтения ТП. Так, время выбора ответа после прочтения ТП достоверно превышало аналогичное время после прочтения КП (4,4 vs. 3,4 с, $p < 0,01$).

Известно много работ, в которых исследованы параметры движений глаз при разрешении синтаксической неоднозначности в разных языках (Rayner, 1998). В настоящей работе мы впервые использовали методику регистрации движений глаз для исследования разрешения синтаксической неоднозначности в русском языке.

Вопросы изучения языка сложны, прежде всего, с точки зрения поиска адекватных экспериментальных моделей для исследования языковых процессов. Наши результаты открывают перспективу использования психофизиологических показателей для объективной оценки языковой деятельности (в частности, синтаксического анализа).

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ЭКСПЕРИМЕНТАЛЬНОЕ ВЫЯВЛЕНИЕ КОГНИТИВНОГО 3D-ВОСПРИЯТИЯ ПЛОСКИХ ИЗОБРАЖЕНИЙ

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Известно, что естественно-природное зрительное восприятие основано на механизме стереоскопии и бинокулярной диспаратности. Две проекции на сетчаточных структурах глаз образуют несколько смещенные 2D-изображения объектов среды обитания, которое расшифровывается мозгом как объемные предметы с пространственной перспективой по глубине поля зрения. При рассматривании любых плоских картин на сетчаточных изображениях образуются идентичные проекции. Следовательно, по физиологически-физическим принципам они не должны создавать эффектов глубины, пространственной перспективы, соизмеримых с эффектами от бинокулярной диспаратности.

В Казанском (Приволжском) федеральном университете выявлена и исследуется способность восприятия образов плоских изображений с уровнем глубины, пространственной перспективы (далее когнитивная глубина), соизмеримой с эффектами объемного восприятия при наблюдении стереоскопических проекций, т. е. с условиями бинокулярной диспаратности. На способность когнитивного 3D-восприятия плоских изображений, методику обучения, ее техническое обеспечение получено восемь патентов России на изобретения. В текстах первичных материалов к патентам с первым приоритетом от 03.02.2003 г. (Антипов 2005) утверждается, что любые плоские изображения можно воспринимать как трехмерные объекты. В том числе и произведения живописи (Антипов 2008). Предполагается, что происходит процесс развития стереоскопического зрения (Антипов 2010 и др.).

Возможной причиной развития восприятия глубины и объема плоских изображений может быть тренинг наблюдения стереоскопической глубины на стереоскопических проекциях в условиях наложения (или фузии). Приобретенный таким образом опыт переносится в дальнейшем

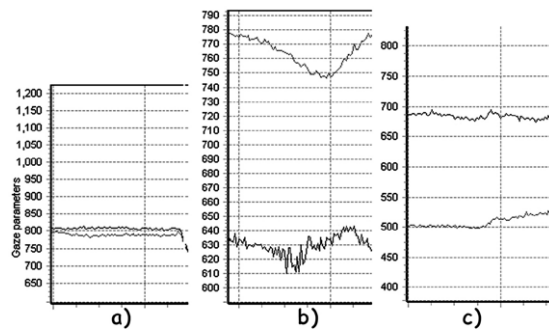


Рис. 1. Показания значений X-координат направления зрачков глаз

на любые плоские изображения. С другой стороны начальные элементы возникновения когнитивной глубины выявлены почти у 90% молодых людей возраста 14–22 года (выборка ~1000 человек).

Ниже представлены результаты экспериментальных исследований по измерению уровня когнитивной глубины, полученные при регистрации моторики движения глаз на бинокулярном и монокулярном айтрекерах, выполненные в Центре экспериментальной психологии Московского городского психолого-педагогического университета и Институте физиологии им. И.П. Павлова РАН. Испытуемым был первый автор доклада.

Бинокулярный айтрекер SMI High Speed. При восприятии плоского изображения зарегистрировано два крайних варианта значений X-координат направления зрачка правого и левого глаза. В первые моменты наблюдается совпадение X-координат (рис. 1-а). В последующем, когда, по утверждению испытуемого, возникают эффекты когнитивной глубины, появляется разность показаний $\Delta X^{\text{ког}}$ (рис. 1-б). При наблюдении стереоскопической глубины на стереоскопических проекциях разность показаний X-координат (рис. 1-с) правого и левого глаза ($\Delta X^{\text{стерео}}$) соизмерима с $\Delta X^{\text{ког}}$.

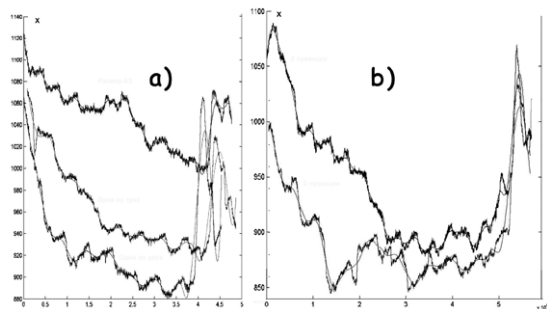


Рис. 4. Текущие значения обобщенной X-координаты

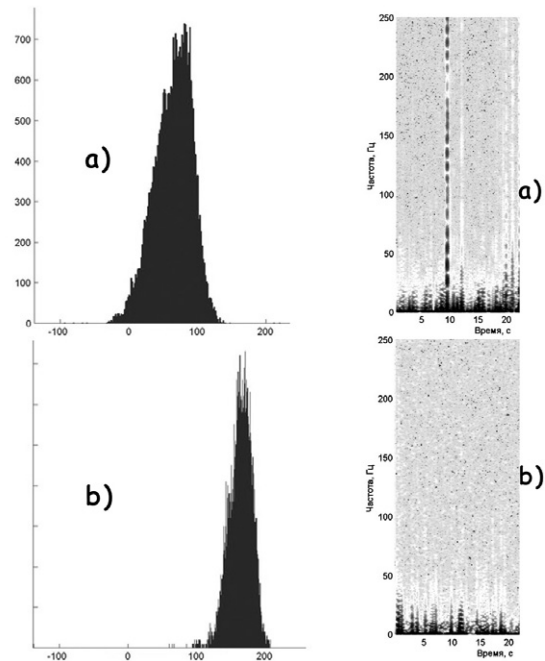


Рис. 2. Гистограммы разности показаний X-координат глаз

Рис. 3. Спектрограммы рядов

На рис. 2 показаны контуры гистограмм разности текущих значений X-координат при восприятии когнитивной (рис. 2-а) и стереоскопической глубины (рис. 2-б). Мы полагаем, что в первую очередь именно полуширина контура гистограммы разности свидетельствует о наблюдаемых эффектах глубины, а затем и смещение центра контура гистограмм.

Третьей особенностью являются спектрограммы динамических рядов изменений X-координат. При регистрации когнитивной (рис. 3-а) и стереоскопической (рис. 3-б) глубины зафиксированы частоты колебания зрачков

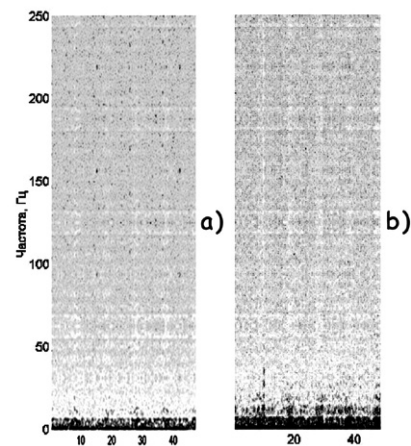


Рис. 5. Спектрограмма рядов

глаз диапазона до 50 Гц, локальные интервалы с гармониками всего диапазона частот.

На монокулярном айтрекере (Jozz-Novo, Oberconsulting, Poland) регистрировались обобщенные X-координаты направления положения зрачков глаз. Эксперименты показали, что при изменении условий наблюдения когнитивной (рис. 4-а) и стереоскопической (рис. 4-б) глубины смещаются уровни значений X-координат.

При наблюдении когнитивной (рис. 5-а) и стереоскопической (рис. 5-б) глубины выявлены частоты колебаний в области до 25–50 Гц (темный фон) и периодические гармоники во всем диапазоне частот (светлые линии).

Представленные результаты показывают, что моторика движения глаз, ее регистрация на айтрекере позволяет выявить эффекты восприятия

глубины и объемности образов плоских изображений. Получено, что восприятие когнитивной глубины соизмеримо с глубиной, возникающей за счет бинокулярной диспаратности стереопроекции в условиях фузии. На монокулярном айтрекере эффекты когнитивной глубины выявляются при масштабировании рассматриваемых изображений.

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ПРОСОДИЯ: ПРЕДЪЯВЛЕНИЕ КОЛЛЕКЦИИ ИЛИ ИСПОЛНЕНИЕ ПРОГРАММЫ?

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В статье Ламба, 2008, посвященной изучению лингвистической системы отдельного индивидуума, приведено следующее соображение: «Человек... производит сборку слова «здесь и сейчас», из чего следует, что внутренними (*т.е. хранящимися в мозге, примечание автора*) являются не слова, морфемы или что-то им подобное, но **средства продуцирования** таких форм». Человек обладает двумя инструментами предъявления этих средств – письмом и акустической речью. Представляется естественным, что оба эти инструмента наследуют свойство лингвистической системы быть не хранилищем коллекции каллиграфических символов и просодических единиц, а инструментом их продуцирования. В докладе описывается и непосредственно «в живом виде» демонстрируется простой в наблюдении экспериментальный факт, подтверждающий представление о просодии как об инструменте продуцирования, имеющем форму исполняемой программы генерации звуков членораздельной речи.

При проведении исследований колебаний поверхностных мягких тканей тела человека, возбуждаемых акустическим полем в воздухе, автор обратил внимание, что при достаточно высокой, но не оглушающей громкости тонального звука с частотой в окрестности 3 кГц персонал

лаборатории начинал шепелявить. Для проверки явления в специальной заглушенной акустической камере было исследовано около 20 человек. Проведенная независимая экспертиза подтвердила факт возникновения шепелявости. Среди всех испытуемых лишь один оказался неуязвим к воздействию. Полученный результат не был опубликован, т.к. выдался на трудное для научных занятий в России начало 90-х годов, но и не забылся. Интерес к нему вернула упомянутая статья Ламба, 2008.

Будем считать, что акустическая речь представляет собой цепь просодических актов. С физиологической точки зрения эти акты являются одновременно и мышечными моторными актами. В этом смысле просодия тождественна локомоции. Однако о локомоциях, включая удержание позы, начиная с известных работ Гурфинкеля с соавторами, 1966, достоверно известно, что они являются исполняемой программой не только в случае произвольных (осмысленных), но и непроизвольных (автоматических) движений. Эта программа использует хранящуюся в центральной нервной системе внутреннюю модель тела и интерпретатор афферентных (центростремительных) потоков данных, поступающих от систем экстра- и интерорецепторов, сигнализирующих о текущем физическом состоянии внешней и внутренней среды, соответственно. Сопоставление исполняемой программой текущего положения тела с желаемым приводит к генерации эфферентных потоков и последующим мышечным моторным актам.

Если модель тела не соответствует реальности или если потоки эфферентных данных интерпретируются неадекватно, то и двигательный акт становится неадекватным. Например, известно, что при поражении органа слуха и вестибулярного аппарата после скарлатины движения руки, похожие на замах при метании камня, могут приводить к падению. Также известно, что при компенсациях проявлений остеохондроза, человек воспринимает как эквитонометрическое искривленное положение своего тела. Известны и другие двигательные иллюзии, в частности, связанные с действием невесомости.

Представляется естественным полагать, что при просодии происходит примерно то же самое, что и при локомоции, а главный афферентный поток данных поступает от слухового анализатора. Если при этом к звукам слышимой собственной речи человека подмешивается внешний звук, интерпретируемый как собственный, то генерируемые управляющие эфферентные потоки неизбежно окажутся искаженными, что, соответственно, приведет и к искажению речи.

В наблюдавшемся случае индуцированной шепелявости, по-видимому, происходит

следующее. Сам оратор воспринимает внешний свистящий звук как результат собственной просодии и, соответственно, «недорабатывает» в воспроизведении свистящих. Слушатель же, отчетливо различает внешний свист и шепелявую речь оратора. Иное объяснение эффекта индуцированной шепелявости представляется затруднительным.

По-видимому, аналогичные эффекты могут происходить и при реализации иных просодических единиц в том случае, если подмешиваемая помеха интерферирует с акустическим сигналом собственной речи оратора. Это открывает некоторые перспективы целенаправленного экспериментального исследования механизмов просодии и прагматических исследований в области логопедии и формировании речи без акцента.

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СОЦИАЛЬНОСТЬ НАУЧНОГО ПОЗНАНИЯ (НА ПРИМЕРЕ РАЗВИТИЯ ОТЕЧЕСТВЕННОЙ ПСИХОЛОГИИ ПЕРВОЙ ПОЛОВИНЫ XX СТОЛЕТИЯ)

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Традиционно социальность научного познания понимается как социальная детерминированность развития науки. Однако современные постнеклассические тенденции в осмыслении научного познания предполагают преодоление детерминистского подхода и раскрытия закономерностей самоорганизации субъекта научного познания. Вместе с тем большая наука как дитя XX века обуславливает необходимость обращения не только к индивидуальному, но и к коллективному уровню субъекта познания. Таким образом, социальность научного познания – это обусловленность развития науки деятельностью коллективного субъекта.

Среди форм коллективного субъекта научного познания выделяются не только разные виды малой группы, научная организация, но

также научное сообщество и общество в целом (Ярошевский 1979; Юревич 2001 и др.). В проведенном исследовании прошла апробацию модель социально-психологической детерминации развития психологической науки (Артемьева 2011). Учитывались уровни общества, научного сообщества, научного микросоциума ученого (подуровни научно-социального круга, научной организации и первичного исследовательского коллектива). В качестве механизмов социальной детерминации развития психологии рассматривались социализация, социализация в науке, дискуссии, руководство и ученичество. Данная модель позволила изучить зависимость развития психологического познания от особенностей его коллективного субъекта.

Результаты составления и анализа социальных биографий основных теоретических и научно-практических течений в России первой половины XX столетия позволили определить наиболее значимые события социальной истории отечественной психологии этого периода:

революция 1905 г., революция 1917 г., год «великого перелома» и начала первой «пятилетки» (1929 г.), годы «большого террора» и «ежовщины» (1936–1938 гг.), Великая Отечественная война (1941–1945 гг.) – на уровне общества; постановление ЦК ВКП (б) «О педологических извращениях в системе наркомпросов» 1936 г. – на уровне научного сообщества. Полученная в результате периодизация позволила структурировать дальнейшее исследование.

Основным материалом анализа стали научные работы ведущих российских психологов, опубликованные на русском языке в 1901–1950 гг. Выборка психологов составлена на основе показателей индекса научного цитирования и экспертной оценки. В итоге в анализе участвовали 2339 работ 41 психолога. Заголовки публикаций были подвергнуты сленговому анализу. Применялась методика анализа взаимосвязи проблематики работ ученых, предложенная в работах С.Д. Хайтуна 1974. На основе рубрикатора психологических направлений и проблем, представленного в монографии В.А. Кольцовой 2009, подсчитывалась частота обращения к каждой из 47 областей-проблем психологического исследования, в частности, к общей, педагогической, возрастной, сравнительной психологии и т.д. Степень взаимосвязи научной проблематики определялась с помощью коэффициента ранговой корреляции Спирмена. Подсчитывались показатели взаимосвязи между проблематикой одного ученого в разные периоды, между проблематикой ученого и его учителя, руководителя, между разными учеными в один и в разные периоды истории развития отечественной психологии. Это позволило определить зависимость динамики научного познания от социального влияния на разных уровнях коллективного субъекта.

В результате анализа обозначилось не только влияние ученичества, руководства, оппонентного круга и социализации на направление научного исследования, но и иерархический характер данного влияния. Обнаружены более высокие показатели взаимосвязи проблематики работ отдельных авторов с проблематикой работ других ученых в определенный период (в периоды 1918–1928, 1929–1936 и 1946–1950 гг.), нежели с проблематикой собственных работ в разные периоды. Очевидно, что данные показатели свидетельствуют не только о закономерной смене научной проблематики в течение жизни каждого ученого, но и о единстве социальных факторов, определяющих направление этих изменений. Так, например, проблематика работ А.Р. Лурия обнаружила взаимосвязь с проблематикой работ

руководителя организации (Института экспериментальной психологии) К.Н. Корнилова (в период 1918–1928 гг. $r=0,37$, значим при $p \leq 0,02$). Уровень корреляции даже выше, чем уровень взаимосвязи с проблематикой работ его коллеги-учителя – Л.С. Выготского (в период 1929–1936 гг. $r=0,29$, значим при $p \leq 0,05$). Вместе с тем в этот период обнаружен тот же уровень взаимосвязи (значимый при $p \leq 0,05$) с проблематикой работ членов оппонентного круга А.Р. Лурия – не только сотрудника того же первичного исследовательского коллектива А.Н. Леонтьева (0,30), но и других лидеров советской психологии – Б.Г. Ананьева (0,28) и П.П. Блонского (0,30). Эти значения выше, чем показатели корреляции проблематики исследований самого А.Р. Лурия в разные периоды социальной истории развития отечественной психологии (максимальный уровень корреляции 0,27 обнаружен между проблематикой его работ в периоды 1918–1928 и 1929–1936 гг., а также 1942–1945 и 1946–1950 гг.). Данные показатели свидетельствуют в пользу гипотезы об иерархическом характере организации субъекта научного познания. Существенное, часто решающее, значение в социальном влиянии на направление развития науки имеет общество: в частности, значительный рост взаимосвязи проблематики научных работ обнаружен в период после революции 1917 г. Не менее значима ситуация в научном сообществе, особенности научной политики: так, постановление 1936 г. на долгие 10 лет приостановило формирование методологического единства, коллективного субъекта советской психологии. Определенное влияние оказывают руководство, ученичество, научные дискуссии, отвечающие за организацию научного познания на уровне научного микросоциума: выявлен рост взаимосвязи проблематики научных работ ученых и работ их учителей, руководителей научных организаций, а также коллег по первичному исследовательскому коллективу.

Таким образом, в ходе проведенного исследования реализовано представление о социальности научного познания как коллективном характере ее субъекта. Получены результаты, свидетельствующие о взаимосвязи социальной ситуации в обществе и научном сообществе, о приоритете социального влияния научного сообщества над влиянием первичного исследовательского коллектива. При организации исследования не подвергалось сомнению решающее значение индивидуального уровня научного познания. Однако основные результаты подтверждают необходимость учета социальности науки как ее самоорганизации и на коллективном

уровне познания, при оценке (экспертизе) и планировании научно-исследовательских работ.

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РАЗЛИЧИТЕЛЬНЫЕ ОСОБЕННОСТИ ОБЪЕКТИВНОЙ И СУБЪЕКТИВНОЙ КАРТИН ОБРАЗОВ ПСИХИЧЕСКИХ СОСТОЯНИЙ ВО ВРЕМЕННОМ КONTИНУУМЕ «ПРОШЛОЕ-НАСТОЯЩЕЕ-БУДУЩЕЕ»

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Образ психического состояния является обобщенным представлением о состоянии. Формирование образа обеспечивается внутренними процессами переживания и когнитивными процессами познания своих переживаний. Через отражение внутренних ощущений в сознании и сличении с имеющимся опытом переживания состояний образуется образ состояний. Мы рассматриваем модель образа, содержащую объективные оценивания и субъективные описания психических состояний. Исследование, проведенное нами, было направлено на определение различительной специфики образов психических состояний во временном континууме «прошлое-настоящее-будущее». В нем приняли участие 93 человека (студенты 1, 2, 3 курсов факультета психологии КФУ: 11 юношей, 82 девушки). В их задачу входило **объективное оценивание** психических состояний с помощью методики «Рельеф психического состояния» и **субъективное описание** состояний с помощью самоотчетов в произвольной форме в диапазоне от года назад (прошлое) до года вперед (будущее) через актуальное время (настоящее). Отметим, что прошлое представлено временными срезами неделя назад, месяц назад, год назад, будущее – неделя вперед, месяц вперед, год вперед, настоящее – актуальное время (здесь и сейчас). Сорок объективных параметров методики относятся к четырем подструктурам (психические процессы, физиологические реакции, переживания, поведение), а субъективные описания экспертной комиссией распределены на 18 различных факторов. Описываемые и оцениваемые психические состояния были отнесены с учетом модальности и уровня психической активности к следующим группам: положительные и отрицательные состояния

высокого уровня психической активности, положительные и отрицательные состояния среднего уровня психической активности, отрицательные состояния низкого уровня психической активности (всего пять групп). Данные статистически обработаны.

Общая картина объективных характеристик образа такова. Наибольшую интенсивность, которая снижается в срезе *год назад*, и определенную стабильность значений демонстрирует образ положительных состояний высокого энергетического уровня. В диапазоне *актуальное время – год назад* схожесть динамики характерна показателям образа отрицательных состояний высокого и среднего уровня активности, образа положительных состояний среднего уровня активности. Структура образа отрицательных состояний низкого энергетического потенциала в данном диапазоне достаточно стабильна в значениях своих показателей. В диапазоне *актуальное время – год вперед* схожесть динамик демонстрируют следующие структуры: образа отрицательных состояний высокого и низкого уровня активности, образа состояний среднего энергетического потенциала положительные и отрицательные.

Рассмотрим **целостные образы** каждой группы психических состояний во временном континууме «прошлое-настоящее-будущее» **по субъективным характеристикам**. Образ состояний всех уровней (высокий, средний, низкий) и модальностей (положительная, отрицательная) в актуальное время содержит наибольшее число описываемых характеристик. Образ в срезе *год назад* представлен в сознании более полно, чем образ в срезе *год вперед*. В актуальное время образ отрицательных состояний высокого и среднего уровня активности в своей структуре содержит наибольшее количество оперантов, чем образ других состояний. В срезах прошлого (*неделя назад, месяц назад*) и будущего (*неделя вперед, месяц вперед*) в целом наблюдается снижение значений, которое в будущем

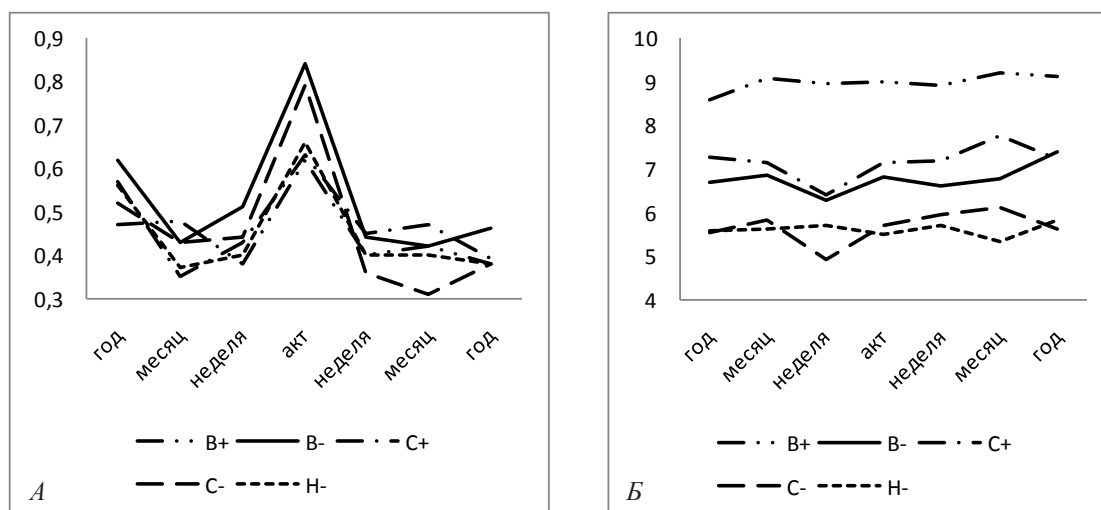


Рис. 1. А. Общая картина субъективных данных Б. Общая картина объективных данных.

продолжается до года, а в прошлом, наоборот, в срезе *год вперед* значения увеличиваются.

Условные обозначения: V+ – положительные состояния высокого уровня психической активности; V- – отрицательные состояния высокого уровня психической активности; C+ – положительные состояния среднего уровня психической активности; C- – отрицательные состояния среднего уровня психической активности; N- – отрицательные состояния низкого уровня психической активности.

Сравнивая объективные и субъективные характеристики образа психических состояний, становится очевидным следующее. В целом объективные характеристики относительно стабильны в значениях во временном континууме, т.е. диапазон значений варьирует в небольших пределах (рис. 1, б). Тогда как субъективные данные демонстрируют выраженные изменения (рис. 1, а). Образ состояний, переживаемых в прошлом, в субъективной картине представлен большим количеством описываемых характеристик, чем образ будущих состояний. Объективная же картина такова, что образ прошлого имеет меньшую интенсивность, чем образ будущего. А актуальный образ по своим значениям находится между ними. При этом образ состояний, переживаемых здесь и сейчас (актуальный образ) в субъективных описаниях

представлен наибольшим количеством оперантов. В отличие от объективного оценивания, где параметры были изначально заданы, в субъективной картине образа состояний обнаружены «нулевые» компоненты, т.е. факторы, которые не были отмечены в описаниях состояний во многих срезах (*сознание, память, воображение, волевые процессы, восприятие, внимание*). Стоит отметить, что эти факторы отражают протекание психических процессов в описываемых состояниях, но при этом в объективной картине образов психические процессы демонстрируют высокую интенсивность.

Было обнаружено, что содержательность (субъективная картина) и интенсивность (объективная картина) характеристик не находятся в прямой зависимости друг от друга. Образ «прошлого» демонстрирует низкую интенсивность, но содержательно насыщен, а образ «будущего» – наоборот, его интенсивность повышается, но в субъективных описаниях представлен слабо. Актуальный образ содержит соответствующую переживаемому здесь и сейчас состоянию объективную оценку и субъективное описание. При этом отличается богатством характеристик, содержательной яркостью и насыщенностью.

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МОЗГОВЫЕ МЕХАНИЗМЫ АКТУАЛИЗАЦИИ ИМЕН СУЩЕСТВИТЕЛЬНЫХ И ГЛАГОЛОВ ПО ДАННЫМ АФАЗИОЛОГИИ И НЕЙРОВИЗУАЛИЗАЦИИ

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В многочисленных исследованиях афазии (нарушений речи вследствие поражений головного мозга) неоднократно было показано, что употребление глаголов и существительных может нарушаться диссоциированно (Goodglass, et al., 1966; Rapp & Caramazza, 1997), что позволило предположить, что за употреблением данных двух грамматических категорий лежат различные мозговые механизмы. В соответствии с одной точкой зрения эти факты свидетельствуют в пользу раздельной репрезентации глаголов и существительных в мозговом субстрате: «глагольная слабость» вызывается поражением левой лобной доли, а называние существительных - поражением левой височной доли (Rapp & Caramazza, 1997).

Иная трактовка диссоциации представлена в нейропсихологической школе А.Р.Лурия. Здесь вслед за Р.Якобсоном и А.Р. Лурия различаются два пути извлечения слова: парадигматический (выбор слова из слов, связанных отношением сходства, т.е. из одного семантического поля) и синтагматический (выбор слова из слов, связанных отношением смежности, т.е. на основе его устойчивых контекстных связей). По данным А.Р. Лурия (1975), выбор слов из парадигм первично страдает при поражениях задних отделов мозга, а выбор с учетом синтагматических связей - при поражениях передних отделов мозга. Сравнительный анализ использования больными с афазией существительных и глаголов, проведенный Н.Н.Полонской, показал, что их актуализация страдает и при передних и при задних формах афазии. При этом больные с передними формами афазий отстают от больных с височными формами афазий в заданиях на ассоциативные ряды, вставку глаголов во фразу, построение предложения по картинке, но опережают в пробе на называние действий. Полученные результаты были проинтерпретированы в пользу концепции о двух путях извлечения слова: у «височных» больных нарушается выбор слова из соответствующей парадигмы, что отчетливо видно в пробе на называние и предметов и действий, требующей максимально

точного выбора слова; у моторных больных первично страдают синтагматические связи, а вторично - парадигматические связи, поэтому нарушаются обе основные функции глагола: номинативная (называние действия) и грамматическая (организация словосочетания и предложения), но больше страдает грамматическая функция (Полонская, 1977, 1978).

Спор афазиологов во многом повторяется сейчас среди специалистов, интерпретирующих данные нейровизуализации, которые показывают различия в паттернах активации при употреблении глаголов и существительных. Среди факторов, определяющих эти различия, называют меньшую перцептивную представленность глаголов, большую длину и частотность глаголов в сравнении с существительными, различия в их грамматической роли в предложении, различия в разнообразии флективных форм у существительного и глагола (Tyler et al. 2004, Siri et al. 2008). В связи с этим представляется целесообразным сопоставить данные афазиологии и нейровизуализации и сделать это на материале русского языка, где и существительные и глаголы обладают богатой системой флексий.

Для проверки гипотезы о том, что мозговая организация употребления слов зависит не от части речи (глагол или существительное), а от способа актуализации слова (по синтагматическим или по парадигматическим связям) и может быть различной для одних и тех же частей речи при различных способах их актуализации, на данный момент нами проводится исследование с использованием функциональной магнитно-резонансной томографии (фМРТ). Оно построено так, что одни и те же глаголы и существительные актуализируются с использованием то парадигматических связей (дополнение ассоциативного ряда), то синтагматических (завершение предложения).

В данной работе представлена попытка проследить различия в зонах активации, получаемых при актуализации глаголов и существительных по картинкам.

В исследовании приняли участие 8 здоровых праворуких добровольцев (возраст от 21 до 38 лет, 4 женщины), каждый из которых выполнял по два активирующих задания, каждое из них во время отдельной серии процедуры фМРТ. В обоих случаях в экспериментальном

условии испытуемым предъявлялись изображения предметов, относительно которых испытуемые выполняли речевую задачу, а в контрольном – бессмысленные спиралеобразные изображения, появление которых не должно было сопровождаться речевой активностью. Экспериментальные и контрольные блоки чередовались и продолжались по 23 секунды. Задача на назование существительных заключалась в том, чтобы проговорить про себя название предмета, а на назование глаголов – в том, чтобы проговорить про себя название типичного действия, которое совершается с помощью этого предмета (глаголы подобраны на основе словаря Dragoy et al., unpublished).

Функциональная МРТ проводилась на томографе Siemens Magnetom Avanto 1.5T с помощью ЭП-последовательности с параметрами TR/TE/FA – 2520 мс/50мс/90°, размеры воксела 3,6×3,6×3,8 мм. Обработка результатов проводилась с помощью пакета SPM8. Для групповых данных (модель случайных эффектов) приводимые результаты соответствуют уровню значимости $p=0,001$ без поправки на множественные сравнения. Анализировались активированные кластеры размером не менее 5 вокселей.

При актуализации глаголов и существительных обнаружены сходные кластеры активации в нижней височно-затылочной области и предцентральной извилине билатерально, правой нижней лобной извилине. При назывании глаголов появляются дополнительные кластеры активации в районе левого нижнего лба и инсулы, дополнительной моторной коры, верхней височной и надкраевой извилины, правом полушарии мозжечка. Полученные результаты соответствуют данным литературы, согласно которым при

назывании глаголов наблюдается больший объем активации и появление дополнительной активации в нижней лобной извилине (Perani et al., 1999; Tyler et al. 2004; Siri et al. 2008). Объединяя данные этих авторов и наши, можно сделать вывод, что актуализация названий предметов и действий предполагает активацию одних и тех же лобно-височных отделов, но вовлечение синтаксических процессов (актуализация синтагматических связей) вызывает дополнительную активацию левой нижней лобной извилины (см. Siri et al. 2008). Эта интерпретация находится в русле Лурьевской афазиологии и нейролингвистики, однако требуются дополнительные исследования для ее всестороннего обоснования.

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ОБЪЕКТИВНЫЕ ХАРАКТЕРИСТИКИ МЫСЛИТЕЛЬНОГО ПРОЦЕССА В УСЛОВИЯХ ОГРАНИЧЕНИЯ ВРЕМЕНИ

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Исследования, связанные с объективной регистрацией мыслительных процессов, имеют длительную историю (Д.Н. Завалишина, В.П. Зинченко, В.Н. Пушкин, Э.Д. Телегина, О.К. Тихомиров, D. Kahneman). Разработка новых технологий в этой области, позволяющих проводить микроанализ мышления, – одно из перспективных направлений современной

когнитивной науки (P. Carpenter, I. Schwank, F. Vigneau).

Цель исследования: выявить особенности процесса решения мыслительных задач и динамику умственных усилий в условиях ограничения времени.

Согласно полученным ранее данным, при введении инструкции на ограничение времени испытуемые начинают выполнять задания существенно быстрее, что свидетельствует о спешке, т.е. следовании требованию инструкции. При этом у большинства испытуемых (66%) эффективность мыслительной

деятельности снижается, у некоторой части – сохраняется (9,2%) или даже повышается (24,8%). Качественный анализ глазодвигательной активности позволил выявить отдельные процессуальные изменения решения задач в режиме ограниченного времени, связанные с трансформацией таких компонентов решения, как выдвижение гипотез, их вербализации, контроль правильности решения, количество изучаемых элементов условий задачи, время поиска закономерностей (Бабаева, Ротова, 2010, 2011). На основе этих результатов для дальнейшего количественного анализа полученных данных были сформулированы следующие предположения.

Гипотезы. Фактор ограничения времени влияет на эффективность процесса решения задач, его временные и энергетические характеристики. Это влияние опосредовано сложностью решаемых задач, интеллектуальным ресурсом субъекта и субъективным принятием задачи (вовлечённостью).

Методика. Задания теста «Классические Стандартные Прогрессивные Матрицы» (Равен и др. 2002) были разделены на 2 части: сначала предъявлялись нечётные задания в свободном временном режиме, затем – чётные в режиме ограниченного времени. В обоих режимах производилась регистрация движений глаз с помощью установки iViewX v.1.03.03 и записывалась вербальная активность. Для обработки данных применялся дисперсионный анализ. **Испытуемые:** студенты московских вузов 18–26 лет, 16 девушек, 15 юношей.

Результаты и их обсуждение. Существенной характеристикой мышления является его эффективность, отражающая как интеллектуальные возможности (ресурс) субъекта, так и его вовлечённость в задачу. Эффективность определялась по количеству правильно решённых заданий. По величине этого показателя в свободном временном режиме испытуемые были разделены на три группы: «успешные», «средние» и «наименее успешные». Согласно принципу прогрессивности, все задания теста были разделены на простые, средней сложности и сложные. В режиме ограничения времени на фоне общего снижения количества правильных решений различия между группами усилились ($F=5,89$; $p<0,008$). Разным оказалось и влияние сложности заданий на эту динамику. «Наименее успешные» в обоих режимах снижали показатель эффективности по мере усложнения заданий. В свободном режиме «успешные» эффективно решали задачи вне зависимости от сложности, при этом «средние» проигрывали им на заданиях средней сложности. В режиме ограничения времени и те, и

другие значительно снижали эффективность в основном на сложных заданиях, где эффективность «средних» приближалась по уровню к «наименее успешным» ($F=3,37$; $p<0,05$). Таким образом, влияние сложности задачи на эффективность мышления, вероятно, опосредуется динамикой вовлечённости. Выраженная мобилизация отмечалась у испытуемых со средним интеллектуальным ресурсом при решении сложных задач без спешки, у «успешных» и «средних» – задач средней сложности при спешке.

Для анализа прилагаемых умственных усилий как энергетической характеристики процесса решения использовался показатель диаметра зрачка. Увеличение прилагаемого усилия само по себе не обеспечивает правильности решения, а, скорее, отражает вовлечённость в задачу (по Д. Канеману). По тестовым заданиям в целом различий в диаметре зрачка между группами «успешных» и «наименее успешных» не обнаружено, а у «средних» он оказался значительно меньше ($F=4,70$; $p<0,001$). При работе в режиме ограничения времени у «наименее успешных», в отличие от остальных групп, средний диаметр зрачка уменьшался ($F=4,88$; $p<0,008$). Таким образом, решая задачи в свободном режиме, наименее успешные испытуемые в среднем прикладывали не меньше усилий, чем остальные, что позволяет сделать вывод о том, что их отставание в успешности обусловлено скорее не слабой вовлечённостью в задачу, а низким уровнем интеллектуальных возможностей. Вместе с тем, разница в успешности «средних» и «успешных» может объясняться как меньшими интеллектуальными возможностями «средних», так и их слабой вовлечённостью. Согласно полученным результатам, если интеллектуального ресурса оказывается относительно мало, то при спешке человек снижает усилия, прикладываемые к задаче.

Важнейшей характеристикой процесса решения является его продолжительность. Её учет осуществлялся с помощью регистрации времени, затрачиваемого испытуемым на выполнение каждого отдельного задания. В обоих режимах время решения росло в зависимости от сложности задачи, наиболее заметно – у группы «успешных» ($F=7,33$; $p<0,001$). В режиме ограничения времени степень сокращения времени решения относительно свободного режима оказалась выше для более сложных задач ($F=17,0$; $p<0,001$). Таким образом, влияние спешки на длительность решения усиливается в сложных заданиях. Кроме этого, процесс решения длится в целом дольше у испытуемых с большими интеллектуальными возможностями, и ярче эта

зависимость проявляется при выполнении более сложных заданий.

Один из основных компонентов процесса решения задачи – анализ ее условий. В нашем исследовании за показатель развернутости такого анализа принималось время фиксаций взгляда на матрице. В обоих режимах доля таких фиксаций в общем времени решения увеличивалась в зависимости от сложности задачи ($F=3,53$; $p<0,05$). Также доля фиксаций на матрице различалась по группам: у «успешных» она оказалась наибольшей ($F=78,44$; $p<0,001$). В режиме ограничения времени этот показатель снижался, сильнее всего – у группы «успешных» ($F=4,57$; $p<0,05$). Таким образом, при спешке анализ условий сильнее всего сокращается у испытуемых с большими интеллектуальными возможностями. Эти испытуемые в целом склонны отводить анализу условий задачи большую роль, нежели остальные. Роль анализа условий в общем

времени решения также увеличивается с повышением сложности заданий.

Выводы. Фактор ограничения времени влияет на основные характеристики процесса решения мыслительных задач: его эффективность, длительность, анализ условий задачи, прикладываемые умственные усилия. При спешке динамика вовлеченности в процесс решения зависит от его интеллектуальных возможностей субъекта. Люди с относительно низким интеллектуальным ресурсом склонны уменьшать свои умственные усилия. Сложность тестовых заданий оказывает влияние на динамику эффективности решения, его общей длительности и места в ней анализа условий задачи. Интеллектуальные возможности субъекта также обуславливают эти характеристики процесса решения и при спешке опосредуют влияние сложности задания на динамику его анализа и эффективность решения.

КОРПУСА И БАЗЫ ДАННЫХ КОНЦЕПТУАЛЬНОЙ МЕТАФОРЫ: ЗАРУБЕЖНЫЙ ОПЫТ СОЗДАНИЯ

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Естественный язык крайне метафоричен по своей природе – частотность метафоры в среднем составляет около 5 употреблений на 100 слов текста или 0,32 употребления на 1 предложение (Polio et al. 1990, Martin 1994, Shutova, Teufel 2010). Следовательно, полноценная автоматизированная обработка текстов на естественных языках (natural language processing, NLP) невозможна без автоматизированной обработки метафоры. В свою очередь, наличие корпусов и баз данных является важнейшим условием для создания и развития систем обработки метафоры.

Попытки создания корпусов и баз данных концептуальных метафор для западноевропейских языков начали предприниматься с начала 1990-х гг., и количество таких проектов постоянно увеличивается, охватывая все новые языки. Наиболее полными ресурсами подобного рода на сегодняшний день являются Амстердамский метафорический корпус английского языка – VU Amsterdam Metaphor Corpus (Pragglejaz Group 2007, Steen et al. 2010) и база данных системы ATT-Meta (также для английского языка), созданная при Бирмингемском университете (Wallington et al. 2003, <http://www.cs.bham.ac.uk/>

research/projects/attmeta/DatabankDCA/tree/index.html). Помимо этого, в 2002–2008 гг. в университетах Гамбурга и Перуджи велась работа над Гамбургской и Итальянской метафорическими базами данных для немецкого/французского и итальянского языков соответственно (Alonge 2006, Loenneker-Rodman 2008).

Большой интерес представляет Программа по исследованию концептуальной метафоры – Metaphor Program, – запущенная в ноябре 2011 г. Агентством передовых методов исследования в сфере разведки (Intelligence Advanced Research Project, IARPA) при Управлении директора национальной разведки США. Предполагается, что результатом проекта должна стать база данных и система автоматической обработки концептуальных метафор в четырех языках – английском, испанском, русском и фарси (http://www.iarpa.gov/solicitations_metaphor.html).

Остановимся более подробно на описании Амстердамского метафорического корпуса и лежащих в его основе инновационных техник метафорической идентификации и разметки.

Амстердамский метафорический корпус, созданный при Амстердамском Свободном Университете, представляет собой выборку из Британского национального корпуса объемом около 200 тыс. слов, размеченную с применением процедуры идентификации метафоры MIPVU. Процедура основана на дифференциации

в конкретном контексте основного и вторичных значений каждой лексической единицы. Основное значение лексической единицы определяется следующим образом: 1) Значение обладает наибольшей из всех имеющихся значений для данной лексической единицы предметной соотносительностью; 2) Значение обладает наибольшей телесно-сенсорной соотносительностью; 3) Является наиболее четким и конкретным; 4) Исторически предшествует другим значениям. Значения, не удовлетворяющие этим критериям, считаются вторичными и, следовательно, метафоричными. Для разметки используется набор тэгов, созданных для процедуры MIPVU.

Далее разработчики предлагают альтернативную процедуру разметки концептуальных метафор по сфере-источнику и сфере-цели. Традиционно выявление концептуальных метафор в текстах производится дедуктивным методом, от предварительно сформулированного набора концептуальных метафор к метафорическим употреблением в тексте, т. е. в направлении сверху вниз (top-down); при этом за основу берется набор метафор, сформулированный в работах Дж. Лакоффа и его последователей, чаще всего Master Metaphor List (Lakoff et al. 1991). Данные источники многократно подвергались критике за отсутствие достаточных эмпирических оснований для формулирования категорий, а также за нелогичность иерархических отношений между категориями. Критика указывает на достаточно высокую субъективность данного метода вследствие того, что исследователь руководствуется категориями, заданными а priori, что может привести к неверной интерпретации или игнорированию анализируемых метафорических употреблений.

Создатели Амстердамского метафорического корпуса предлагают использовать индуктивный подход, направленный от конкретного метафорического употребления в тексте к концептуальной метафоре, т. е. в направлении снизу вверх (bottom-up). Последовательность действий при данном виде анализа такова: 1) Для каждой метафорически употребленной лексической единицы с помощью словарных дефиниций восстанавливается

соответствующий ей концепт на более высоком уровне абстракции. 2) Полученные концепты объединяются во фреймы. 3) Каждое объединение фреймов соответствует той или иной концептосфере. 4) Для каждой концептосферы устанавливается название. Названия концептосфер определяются при помощи WordNet как гипероним к составляющим ее фреймам.

Такой подход, по утверждению авторов, позволяет значительно снизить субъективность процедуры разметки, поскольку он опирается на объективные данные текста и словарей. Некоторая степень субъективности сохраняется лишь на этапе выбора имен для фреймов и концептосфер, но эта субъективность существенно ограничена. Полученные в результате такого анализа концептуальные метафоры зачастую отличаются от традиционно сформулированных метафор большей степенью абстракции входящих в них концептов.

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ВЛИЯНИЕ КОНФИГУРАТИВНЫХ ХАРАКТЕРИСТИК ЛИЦА НА ВОСПРИЯТИЕ ЭКСПРЕССИЙ

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Общепринятый подход к исследованию восприятия эмоций предполагает, что функциональное состояние человека воплощается в тоне отдельных групп мышц, вследствие

чего лицо приобретает соответствующее выражение. В работах П. Экмана и Дж. Фризена выделяются шесть базисных эмоций (радость, удивление, страх, гнев, горе, отвращение), каждая из которых сопровождается описанием ряда мимических признаков (Ekman, Friesen, 1975). К. Изард включает в этот список интерес, стыд и презрение (Изард, 2002). Предложенные фотоэталонные базисных экспрессий эффективно идентифицируются испытуемыми независимо от расовой принадлежности, гендерных и интеллектуальных различий (Ekman, 1973; Ekman, Friesen, 1975; Ekman, Friesen, 1978).

Вместе с тем существуют люди, чьи лица, даже лишенные прямых признаков экспрессий, как бы излучают печаль, радость или удивление. Это указывает на то, что в создании экспрессивных впечатлений участвуют не только мышцы лица, но и его конфигурация – соотношение основных элементов.

Проблема порождения впечатлений об экспрессиях лица, обусловленных его собственной конфигурацией, была поставлена и экспериментально исследована на материале восприятия схематических лиц, составленных из двух черточек и трех эллипсов Э. Брунsvиком (Brunsvik, 1956; Brunsvik, 1937). Он показал, что, меняя относительное расположение глаз, расположение и длину носа и рта (черточек), можно сконструировать впечатления различных эмоциональных состояний и свойств личности. Наиболее радикальные впечатления возникают при изменении положения линии рта и, следовательно, величины подбородка: чем выше расположен рот, тем радостнее и моложе выглядит лицо, но ниже кажущийся интеллект. Сходный эффект дают широко расставленные глаза и короткий нос. Очень длинный нос во всех случаях вызывает отрицательное отношение к лицу, а высокий лоб – положительное. Это означает, что конфигуративные связи схематического лица непосредственно включены в порождение впечатлений и об экспрессиях, и об индивидуально-психологических особенностях их носителя. Данный результат подтверждается более поздними исследованиями, в которых в качестве испытуемых привлекались представители европейской, африканской и китайской культур (Gordon, Zukas, 1982). Косвенное подтверждение наличия тенденций, полученных Брунsvиком, получено в исследованиях Д. Нета и А. Мартинеца на стимульном материале, построенном с использованием фотоизображений из коллекции П. Экмана (Ekman, Friesen, 1976). Демонстрируя испытуемым четыре варианта искусственно трансформированного фотоизображения нейтрального лица одного и того же

человека с разными вертикальными позициями (конфигуративными признаками) носа, рта, глаз и бровей, исследователи нашли, что их варьирование действительно порождает впечатление эмоций, различных по модальности. При коротких расстояниях между глазами и ртом лицо натурщика воспринималось как сердитое, при длинных – как печальное (Neth, Martinez, 2009). Вместе с тем, до сих пор возможность проявления обнаруженных тенденций при восприятии изображения реального лица до конца остается неопределенной.

Пытаясь конкретизировать влияние конфигуративных признаков на восприятие эмоциональных состояний человека, мы разработали методику, построенную на основе систематической трансформации внутренней структуры лица по экспериментальной схеме Э. Брунsvика. Обнаруженные им конфигуративные признаки: (1) высота лба, (2) высота рта и, соответственно, величина подбородка, (3) расположение глаз выступили в нашей методике в качестве независимых переменных.

Экспериментально установлено (Барабанщиков, Хозе, 2009), что впечатления радости и грусти при экспозиции естественных изображений лица значимо связаны с шириной глаз и высотой рта натурщика. Чем выше посажен рот и больше расстояние между глазами, тем выше вероятность восприятия радостного выражения. Обе тенденции соответствуют данным, полученным Брунsvиком при демонстрации наблюдателям схематических лиц.

Дополнительным условием восприятия страха на нейтральном изображении лица служит низкое расположение рта. Наконец, увеличение длины носа и снижение линии рта оказывается предпосылкой впечатления вины, а короткий нос – впечатления презрения.

Полученный экспериментальный материал доказывает, что индуцированные экспрессии реального лица действительно обуславливают выражения ряда базисных экспрессий. Ширина глаз, длина носа, высота рта и глаз играют роль конфигуративных признаков, совокупное влияние которых носит нелинейный характер. Чаще всего впечатление экспрессии возникает в результате сочетания нескольких признаков. Такие базисные экспрессии, как гнев, отвращение и стыд, индифферентны к варьированию конфигуративных признаков и их сочетаний. Воспринимаемая экспрессия субъективно нейтрального состояния лица является системным эффектом его конфигурации.

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СЕМАНТИКА «АТОМИСТИЧЕСКАЯ» И КОГНИТИВНАЯ

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1. Значение с точки зрения атомистического подхода

Идея атомистичности значения стала постулатом научного подхода к описанию семантики языка. В значении языковых форм усматриваются не только неделимые минимальные смыслы, но и даже – по аналогии с ядерной физикой – семантические «кварки», меньшие, чем семантические примитивы (ср. [Апресян 2004] или Е. В. Урысон [Урысон 2004]). Выделение очередных «сверхбесплотных» и «сверхминимальных» единиц семантического метаязыка только убеждает в окончательной победе атомистического подхода к исследованию плана содержания языковых выражений. В то же время обращение к языковому факту – к материи языка – порождает многочисленные вопросы к атомистической идее описания плана содержания. Свидетельств недостаточности атомистического подхода накопилось довольно много. Рассмотрим лишь одну из черных дыр атомистического подхода к значению – семантику идиом¹

2. Семантические «триггеры» узнавания образа

Значение идиом с живой внутренней формой мотивировано образом, лежащим в их основе. Например, идиомы *прикинуться ветошью* и *прикинуться шлангом* очень близки по значению, однако их образы все-таки несколько различаются, и это оказывается достаточным для дифференциации их актуальных значений: метафора ветоши высвечивает в семантике идиомы идею незначительности и незаметности, которая, в свою очередь, вызывает к жизни идею непричастности к чему-то происходящему. Метафора шланга профилирует представление о сущности, легко меняющей свое положение под действием внешних сил и неспособной к мышлению. Отсюда и актуальные значения этих выражений:

прикинуться ветошью = ‘пытаться своим поведением создать у других участников ситуации представление о собственной незначительности и непричастности к происходящему, чтобы избежать неприятных для себя последствий’;

прикинуться шлангом = ‘пытаться своим поведением создать у других участников ситуации представление о собственном непонимании чего-то очевидного и при этом нежелательного для субъекта’.

Типовая ситуация употребления идиомы *прикинуться ветошью* – это описание попытки уйти от опасности. Ср. *На всякий случай охранник упал, отполз в кусты и прикинулся ветошью*. В этом контексте идиома *прикинуться шлангом* явно неуместна: *На всякий случай охранник упал, отполз в кусты и прикинулся шлангом*.

Подобные примеры легко умножить². Насколько аналитическая часть толкования эксплицирует вклад образной составляющей идиомы в ее семантику? Описание метафоры во внутренней форме едва ли можно свести к аналитическому описанию ее области источника и области цели. Метафора должна быть представлена в модели значения как нечто единое – единый образ, целостный гештальт, неразложимый на отдельные составляющие. Для этого естественно обратиться к другой стратегии толкования, основанной не на разложении смысла, а на его **узнавании** как концепта, уже имеющегося в сознании носителя языка. Именно в этом случае появляется возможность апеллировать к метафоре, к образу, как к единому гештальту. Такая стратегия толкования должна основываться не на аналитическом описании метафоры, а на намеке, на «триггере», спускающем крючок ассоциаций, приводящих к нужному образу. Здесь уместно предложить аналогию угадывания слова в кроссворде: именно так может быть устроен триггер-намеки.

В самом простом случае семантический триггер образа может быть достаточно развернутым толкованием слов, передающих образ во внутренней форме. Ср. модель значения идиомы *обивать пороги*: ‘много раз безуспешно приходить в какое-л. учреждение с просьбой о чем-л., что осмысляется как многократное вхождение в помещение, сопровождаемое задеванием за нижнюю часть дверной коробки’.

Семантический триггер, ведущий к распознаванию образа, может быть и совершенно иной природы. В тех случаях, когда образ в идиоме мотивирован прецедентным текстом или культурной реалией, триггер может иметь форму отсылки к соответствующему

¹ О системно обусловленных проблемах атомистического подхода к значению см., в частности, [Баранов, Кобозева 1987], [Баранов 2007].

² Целый ряд примеров такого рода приводится в [Баранов, Добровольский 1998].

культурному феномену, ср. модель значения идиомы *бальзаковского возраста*, в которой семантический триггер вводится оператором 'осмысляемый как': 'женщина среднего возраста или несколько старше, сохранившая привлекательность, демонстрирующая интерес к мужчинам и пользующаяся у них успехом, осмысляемая как женский персонаж произведений О. де Бальзака'.

Перечислить все типы семантических триггеров, создающих эффект узнавания образа, не представляется возможным просто потому, что описание фразеологии в этом направлении только началось. В определенной степени они связаны с типом оператора, вводящим семантический триггер. Для правильного выбора семантического триггера важным оказывается и сам образ – модель внутренней формы, чаще всего это – метафора, лежащая в основе актуального значения идиомы.

Узнавание смысла по «намеку» в модели значения как техника толкования непосредственно обращена к когнитивным категориям – знаниям модели мира человека. В этом отношении данный подход описания семантики языковых форм оказывается чисто когнитивным и способным, тем самым, отобразить в семантической экспликации такие феномены когнитивной сферы, как метафора.

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ПАТТЕРНЫ ТОПОГРАФИИ КОМПОНЕНТОВ ЗРИТЕЛЬНОГО ВЫЗВАННОГО ПОТЕНЦИАЛА ПРИ ИСПОЛЬЗОВАНИИ СИМВОЛЬНОЙ И БУКВЕННОЙ МАТРИЦ В ПАРАДИГМЕ НЕЙРОКОМПЬЮТЕРНОГО ИНТЕРФЕЙСА

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В настоящее время системы нейрокомпьютерных интерфейсов (НКИ), являются одной из наиболее бурно развивающихся областей нейрофизиологии. Они обеспечивают взаимодействие между мозгом и компьютером напрямую без использования органов управления технических устройств. Неинвазивные НКИ генерируют команду периферическим устройствам на основании анализа пространственно-временных изменений биоэлектрических потенциалов мозга [Михайлова и др. 2008, Шишкин и др. 2008, Bobrov et. al. 2011, Farwell and Donchin 1988]. Одним из наиболее перспективных являются неинвазивные НКИ, построенные на основе FD (Farwell-Donchin)-парадигмы. В ее основу положено свойство увеличения амплитуды волны P300 зрительного вызванного потенциала (ЗВП) в ответ на значимую (задуманную испытуемым) букву [Farwell and Donchin 1988]. До недавнего времени в качестве стимулирующих устройств в таких НКИ применялись матрицы, состоявшие исключительно из букв латинского и кириллического алфавитов

[Михайлова и др. 2008, Шишкин и др. 2008]. В то же время символ (пиктограмма) является более информативным, т. к. отражает понятие или определенное действие [Реформатский 1999]. Таким образом, использование символьной матрицы может значительно увеличить эффективность НКИ-систем в случае использования заранее определенного набора команд.

С целью исследования возможности применения символьной матрицы как стимулирующего блока НКИ устройств мы провели сопоставление топографии компонентов ЗВП на стимуляцию символьной и буквенной матрицей в рамках FD-парадигмы. Буквенная матрица представляла собой прямоугольную матрицу 6х6 знаков из букв кириллического алфавита и служебных символов (точка, запятая и т. д.). В символьной матрице были сгруппированы пиктограммы (символы) 6х6 знаков. Стимуляция заключалась в многократном вспыхивании на 100 мс в случайном порядке строк или столбцов стимулирующей матрицы. Значимым считался символ, назначаемый экспериментатором, испытуемый вел счет появления значимых стимулов.

Исследования проводили по стандартной для FD-парадигмы схеме. У девяти здоровых взрослых русскоязычных испытуемых в 18 опытах

осуществлялась 28-канальная запись ЭЭГ, в качестве стимулирующей использовали попеременно буквенную и символьную матрицы. Он-лайн классификация не проводилась. После обработки ЭЭГ были получены зрительные вызванные потенциалы (ЗВП) и анализировались амплитуды и пиковые латентности следующих компонентов ЗВП: N1, P3 (с учетом двух субкомпонент P3a, P3b [Polich 2007]).

Для снижения влияния индивидуальных различий между испытуемыми мы произвели объединение смежных зон регистрации ЗВП, при котором проекция отведений разбивалась на девять областей, каждая из которых содержала группу топографически близких электродов [Cheng et.al. 2010]. Таким образом, компоненты ЗВП каждого испытуемого характеризовались комбинацией из 9 чисел. Для определения степени сходства между ЗВП различных испытуемых была проведена процедура многомерного неметрического шкалирования. В результате мы получили возможность разбить испытуемых на относительно гомогенные группы по типу топографии активности мозга для каждого компонента ЗВП, которая изображалась в виде двухмерных диаграмм. Сопоставление полученных диаграмм позволило выделить устойчивые распределения параметров ответов по 9 областям (паттерны). Одни компоненты ЗВП демонстрировали один и тот же паттерн активности у большой группы испытуемых как для значимых, так и для незначимых букв и символов. Так, для компонента P3 а, отражающего неизбирательное внимание [Polich 2007], для всех вариантов стимулов в 55,5% случаев (5 из 9 испытуемых) выявлен единый паттерн. Область наибольшего отклика для этого паттерна находится в каудальных областях мозга, с акцентом в сагитто-каудальной области. Другие компоненты ЗВП оказались более чувствительными к типу стимула (N1, P3b). Компонент P3b продемонстрировал гораздо большее разнообразие топографий при стимуляции матрицей, содержащей символы, чем хорошо знакомые буквенные стимулы. В топографии амплитуд P3 б был обнаружен паттерн, характерный исключительно для символьной стимуляции. Область его максимального

отклика находится в левой центральной и каудальной областях.

Несмотря на некоторые различия топографии, анализ амплитуд волн ЗВП (N1 и P3 с учетом ее субкомпонентов) показал, что основные закономерности реагирования этих волн на символы (пиктограммы) в целом соответствуют обнаруженным в НКИ при использовании буквенной матрицы. Это позволяет утверждать, что аппаратно-программные устройства, созданные для НКИ с буквенной матрицей, можно с успехом использовать и для НКИ с символьной матрицей, однако при разработке систем классификации необходимо учесть особенности этой стимуляции. Особенно актуально это может быть для пациентов с различными патологиями, для которых процесс набора словесных команд с помощью буквенной матрицы является утомительным.

Функциональная сложность механизмов распознавания букв и символов делает необходимой более детальную статистическую обработку представленных материалов, а также дальнейшие экспериментальные исследования в этом направлении.

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ИЗУЧЕНИЕ МЕТОДОМ ВТОРИЧНОГО ДИФФЕРЕНЦИРОВАННОГО ОТВЕТА ДОМИНИРОВАНИЯ МЕЖДУ ПОСЛЕДОВАТЕЛЬНЫМИ ДЕЙСТВИЯМИ НА ЭТАПЕ ИХ ПЕРЕКРЫТИЯ

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В рамках системно-эволюционного подхода, рассматривающего поведение как результат взаимодействия между функциональными системами (далее системы), включенными в его обеспечение, закономерности такого взаимодействия являются особенно актуальными (Швырков, 1995). При анализе поведения выделяют его внешний (двигательный) и внутренний (психический) аспекты. Эти аспекты как результат межсистемных взаимодействий, хотя и не являются изоморфными, но, тем не менее, имеют тесные связи друг с другом (Ломов, 1984; Швырков, 1995; Безденежных, 2004). Современные методы регистрации активности мозга дают основание полагать, что в основе движения и сопровождающих его психических процессов лежит активность одних и тех же нервных структур (Alexander et al., 1992). Поэтому исследование двигательной активности может служить методом изучения межсистемных отношений, лежащих в основе скрытых психологических процессов. С помощью двигательных показателей поведения были выявлены некоторые закономерности в последовательных действиях (Безденежных 2004). Одна из них – это перекрытие последовательных действий, заключающееся в том, что реализация очередного действия начинается на завершающем этапе предшествующего действия. Другая закономерность – эффект последовательности (ЭП), заключающийся в том, что при последовательной реализации предшествующие действия влияют на характер развития последующего. ЭП связывают с прогнозированием будущего действия с учетом предшествовавших событий (Конопкин, 1980). В этом отношении наиболее успешно исследованы как на человеке, так и на животных точностные действия, которые начинаются с саккадического движения глаз (СДГ) на мишень и заканчиваются указыванием на нее или касанием ее пальцем (Dorris, Munoz, 1998). Показано, что перед СДГ активируются нейроны систем, которые будут обеспечивать действие. При этом сохраняют свою активность нейроны систем, обеспечивающие текущее действие, т.е. на фоне текущего действия формируется план будущего действия.

Изучение нами быстрого печатания предложения одним пальцем показало, что это поведение представлено последовательностью точностных действий, каждое из которых начинается с СДГ на букву (клавишу) и заканчивается ее нажатием. Причем СДГ каждого последующего действия начинается перед нажатием предшествующей буквы, т.е. планирование последующего действия осуществляется на фоне завершения текущего действия (Безденежных, 2004). На нейрофизиологическом уровне именно одновременная активность систем, обеспечивающих два последовательных действия, лежит в основе прогнозирования. Задача работы – оценить степень доминирования систем текущего и планируемого действий на этапе их перекрытия.

Для решения этого вопроса в процедуре быстрого печатания предложения одним пальцем испытуемым в случайном порядке во время нажатия клавиши (буквы) предъявляли высокочастотный звуковой сигнал – «пип». Он предъявлялся примерно в 20% печатаемых предложений. Если «пип» появлялся после нажатия гласной (согласной) буквы, то нужно было прервать печатание и как можно быстрее повторно нажать эту букву. Если «пип» появлялся после нажатия согласной (гласной) буквы, то нужно было продолжать быстро печатать предложение до конца. Во второй экспериментальной задаче, если «пип» появлялся перед нажатием гласной (согласной) буквы, то нужно было как можно быстрее повторно нажать только что напечатанную букву. Если «пип» появлялся перед согласной (гласной) буквой, то нужно было продолжать быстро печатать предложение до конца. В создании этой экспериментальной модели мы исходили из следующего рассуждения. Если одно и то же движение осуществляется с разным временем на один и тот же сигнал, но связанный с напечатанной буквой или с буквой, которую испытуемый планирует нажать, то причиной этого является разное время восприятия этих букв. Это может отражать разную степень активности (доминирования) нейронных систем, обеспечивающих последовательные действия во время их перекрытия. Процедура, в которой испытуемый прерывает в ответ на сигнал основное действие и совершает другое действие, получила название «вторичной реакции». Мы назвали предложенную нами процедуру «вторичный дифференцированный ответ».

В работе сравнивались время вторичных дифференцированных ответов в двух задачах, испытуемые сравнивали степень сложности выполнения задач. Эксперименты показали, что дифференцированные ответы в виде повторного нажатия буквы, или в виде продолжения печатания на сигнал «пип», требующий распознавания напечатанной буквы (первая задача), значительно быстрее, чем выполнение этих же ответов на сигнал «пип», требующий распознавания буквы, на которую субъект перевел взор и планирует ее напечатать (вторая задача). Показано также, что количество ошибок при выполнении первой задачи значительно меньше, чем при выполнении второй задачи, и субъекты оценивали первую задачу как более легкую, чем вторую задачу. Итак, субъект быстрее воспринимает напечатанную букву, нежели букву, на которую он собирается нажать, и, следовательно, на этапе планирования будущего действия доминируют системы

текущего действия, что, по-видимому, влияет на формирование систем последующего действия.

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ОТРАЖЕНИЕ ПРОИЗВОЛЬНЫХ ДВИЖЕНИЙ РУКОЙ В ТРАЕКТОРИЯХ «БЕГУЩЕЙ ВОЛНЫ ЭЭГ»

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«Бегущей волной ЭЭГ» называется рост запаздывания между волнами ЭЭГ по мере удаления электродов - возникнув в одном пункте, волна бежит по поверхности головы по некоторой траектории. Форму траектории и скорость движения волн можно раскрыть по узору рас-согласований между ЭЭГ разных электродов. На интересующую область ставится множество электродов несколькими параллельными рядами. Имеет смысл измерять запаздывания только соседних электродов, т.к. только в этом случае в анализ попадут «одноимённые» волны. Оптимальное межэлектродное расстояние (шаг решётки) – 2.5-3 см. Однако временной сдвиг столь близких ЭЭГ весьма мал и требует для своего измерения высокой частоты дискретизации (не менее 1000 Гц, лучше 2000).

Траектории движения волн ЭЭГ удобно представить в виде векторных структур, подобных рис.1-Б,В,Г. Расчёт одного вектора проводится по временным сдвигам, образующим катеты прямоугольного треугольника – разбиение поля на рис.1А. Вектор перпендикулярен фронту волны в данной области, а его длина отражает скорость движения. Такие структуры получают

для последовательных эпох анализа из расчета «одна волна – одна эпоха» (для альфа-ритма подходит эпоха 0.1 с). Динамику можно изучать в виде анимации, используя отдельные эпохи в качестве кадров.

Векторные структуры очень причудливы, многообразны и переменчивы, но всегда упорядочены (рис.1-Б,В,Г), т.е. векторы распределены по некоторой закономерности, причём меняют длину согласованно. В покое скорость движения волн меньше, при деятельности растёт. Иногда единое поле распадается на две или несколько независимых областей. В пределах каждой из них волны движутся плавно, а на границах наблюдается их «столкновение», т.е. резкий скачок фазы и формы колебаний. Такое распадение характерно для активных состояний, для покоя – нет (сравните рис.1Б и В). Кроме уровня активности, динамика «бегущей волны» зависит от индивидуальности человека, вида деятельности, утомления. Есть неслучайная связь с анатомией коры – характерные локальные узоры векторов, наподобие фокусов и стоков, обведённых на рис.1Г, приурочены к определённым пунктам.

Цель данной конкретной работы – выявление траекторий «бегущей волны ЭЭГ», специфически приуроченных к произвольным движениям руки – в определённом направлении. Для этого 28 электродов помещались прямоугольником над сенсомоторной корой в районе Роландовой

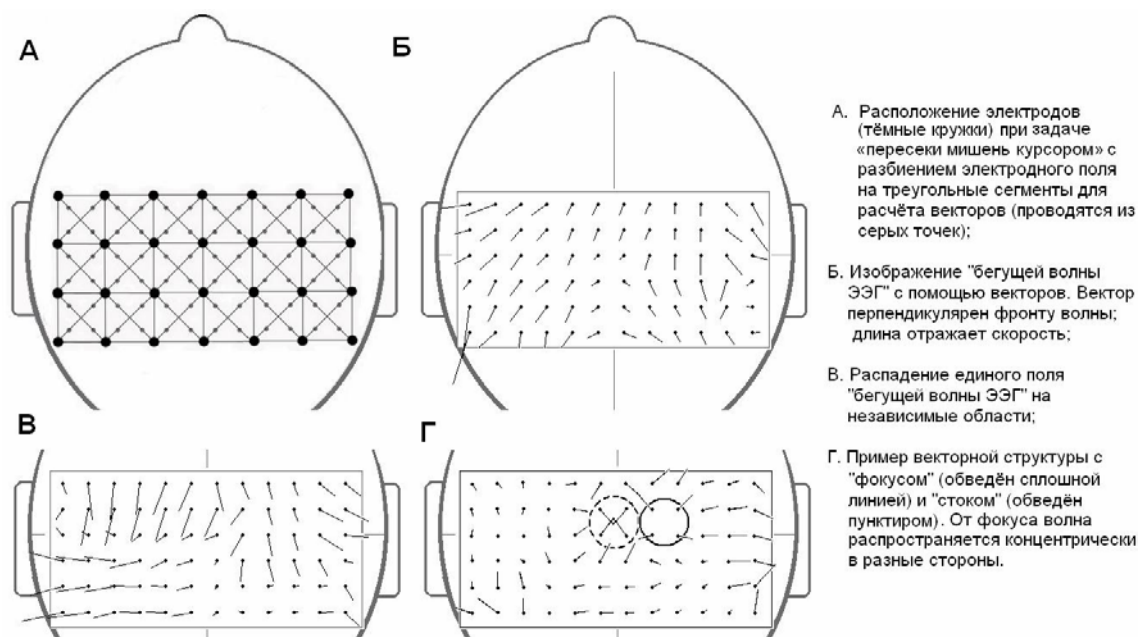


Рис.1. Описание «бегущей волны ЭЭГ» при помощи векторных структур.

борозды по 7 электродов в 4 рядах (рис.1А). Межэлектродные интервалы составляли 2.5-3 см в зависимости от размеров головы.

На мониторе перед испытуемым через случайные промежутки от 0,5 до 1,5 с возникала мишень (ворота шириной 5 см) равновероятно в одном из 4-х положений: справа, слева, сверху и внизу – на краю экрана в середине одной из сторон. Курсор (кружок, управляемый джойстиком) вначале стоит в центре. Задача в том, чтобы провести курсор через ворота, сместив его в одну из сторон на половину экрана. После этого мишень исчезает, испытуемый расслабляет руку и пружина возвращает джойстик в нейтральное положение, курсор сам возвращается в центр. За опыт в каждом из 4-х направлений было 60-80 попыток – за 2 сеанса по 10 мин.

с отдыхом 5 мин. В анализ брались отрезки ЭЭГ между моментом появления мишени и моментом касания её курсором, что составляло 0.6 - 1.2 с, т.е. от 6 до 12 эпох анализа, из которых само движение занимало около трети в конце интервала, остальное – восприятие цели и «центральная задержка». Для каждой попытки строились векторные структуры, а также т.н. плоскость фазового лидерства – восстановление абсолютных моментов появления волны под электродами по измеренным межэлектродным запаздываниям. Для фокуса (рис.1Г) фазовое лидерство максимально, для стока – минимально. Описанные статистики «бегущей волны ЭЭГ» накапливались отдельно для каждого из 4-х сравниваемых условий – по 4-м разным направлениям движения руки.

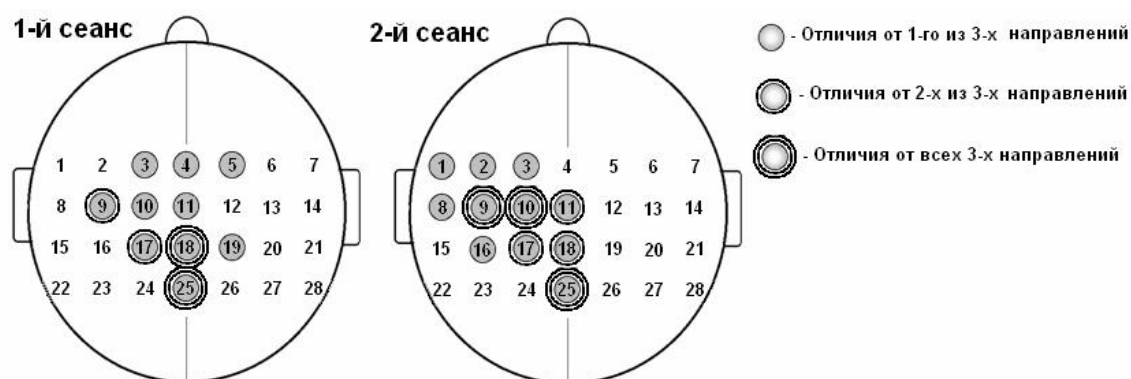


Рис.2. Точки более частого появления «фокусов» при движении джойстика на себя по сравнению с движениями в 3-х других направлениях.

В среднем по 17 людям обнаружены значимые отличия фазового лидерства при движении курсора в направлении «вниз» от всех других направлений. Большинство отличий в левой сенсомоторной коре в районе моторного центра правой руки и в задне-теменной коре по центру (рис.2). Данные 1-го и 2-го 10-минутных сеансов близки. Остальные 3 направления отличаются друг от друга мало. Для движения курсора вниз нужно потянуть джойстик на себя. Можно предположить, что описанные различия ЭЭГ обусловлены

разным представительством в коре генетических моторных программ приматов - для движения «к себе» и «от себя». Фокусы, вероятно, соответствуют наиболее активным кортикальным центрам (на это указывают и другие наши данные).

Выявленная связь произвольных движений с траекториями «бегущей волны ЭЭГ» делает этот показатель перспективным для использования в устройствах по мысленному управлению компьютером или мозг-машинных интерфейсах.

АНАЛИТИЧЕСКИЙ И ХОЛИСТИЧЕСКИЙ СПОСОБЫ ПЕРЕРАБОТКИ ИНФОРМАЦИИ В КОНТЕКСТЕ СОЦИАЛЬНОГО ПОЗНАНИЯ

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Согласно теоретической модели исследования, в качестве когнитивного механизма, лежащего в основе организации общих и эмоциональных способностей, рассматривается особое соотношение аналитического и холистического способов переработки информации. Теоретическое обоснование этого положения апеллирует к двойственным теориям мышления и социального познания (Reber, 1989; Smith, DeCoster, 2000; Evans, 2008; Smith, Neumann, 2005; Пономарев, 1999). *Аналитический способ переработки* заключается в разложении информации на элементы, характеризующиеся логической обоснованностью, последовательностью временных этапов и осознанностью. *Холистический способ переработки* заключается в оценке общих конфигураций информации, характеризующейся быстротой протекания, интуитивным характером решения и минимальной осознанностью. Были выдвинуты предположения о положительной связи 1) аналитического способа переработки нейтральной информации с общим интеллектом; 2) холистического способа переработки нейтральной информации – с креативностью; 3) холистического способа переработки эмоционально окрашенной информации – с эмоциональным интеллектом.

Использовались два типа методик: традиционные тесты способностей и три специально

разработанные методики измерения особенностей переработки информации с фиксацией скорости и точности ответа. В *модифицированной задаче Навона* стимульным материалом являлись изображения больших цифр, состоявшие из маленьких цифр-элементов. Испытуемый должен был указать или цифру-элемент (локальный признак или аналитическая переработка), или букву-целое (глобальный признак или холистическая переработка) нажатием клавиши на клавиатуре. *Методика «Восприятие лиц»* была направлена на изучение особенностей переработки информации о лицах. Задача испытуемого заключалась в сопоставлении отдельных частей (глаз, губ, носов) в предъявляемых парах лиц и принятии решения, являются ли эти части одинаковыми. При этом пары лиц могли быть либо одинаковыми, либо разными во всех чертах (кроме целевой). Предполагалось, что в первом случае необходимо применить холистическую стратегию, т.е. сравнить конфигурацию лиц в целом, что поможет быстрее и точнее определить, есть ли различающиеся элементы. Во втором случае наиболее результативным будет применение аналитической стратегии, т.е. разложение стимулов на элементы с последующим сравнением указанных признаков. *Методика «Социальные ситуации»* была направлена на изучение особенностей переработки информации о ситуациях взаимодействия людей. Стимульным материалом являлись фотографии эмоционально окрашенных сцен социальных взаимодействий. В аналитическом субтесте испытуемые выбирали одно из двух названий к фотографии: при этом одно из названий являлось формальным, другое метко характеризовало эмоциональную особенность ситуации. В холистическом субтесте испытуемым задавался

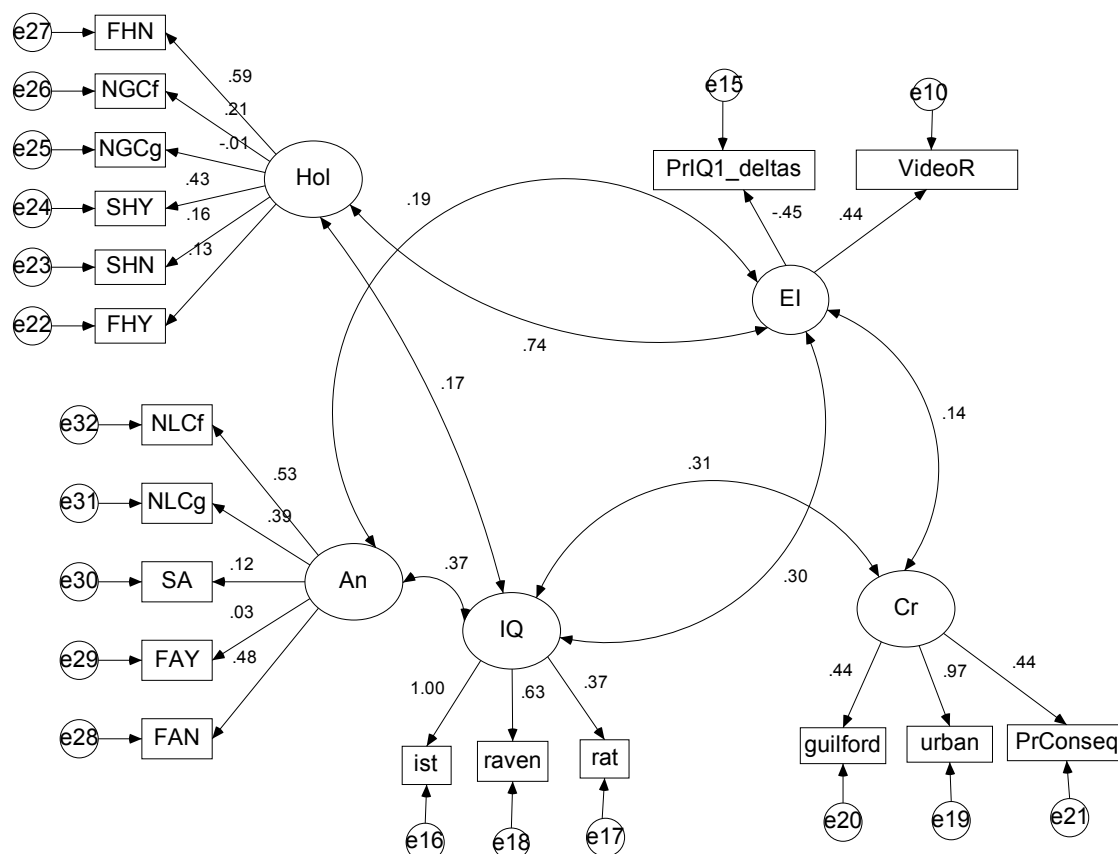


Рис. 1. Конфирматорная модель факторов аналитической и холистической переработки, общего интеллекта, эмоционального интеллекта и креативности.

вопрос об общей оценке эмоциональной окраски ситуации.

Для измерения интеллекта использовались ППИМ Дж. Равена, вербальные шкалы Теста Амтхауэра (адаптация Е. А. Валуевой); невербальной креативности – Рисуночный тест творческого мышления К. Урбана, вербальной креативности – тесты: «Необычное использование» Дж. Гилфорда, «Последствия» Е. П. Торренса, тест отдаленных ассоциаций (адаптация Е. А. Валуевой, Д. В. Ушакова); эмоциональных способностей – видеотест способности к распознаванию эмоций В. В. Овсянниковой, Д. В. Люсина, тест практического интеллекта Д. В. Ушакова, А. Е. Ивановской. Выборку составили 102 человека (59% женщин; ср. возраст 14.9, ст. откл. 0.91). Конфирматорная модель факторов аналитической и холистической переработки, общих и эмоциональных способностей представлена на рис. 1 (Bollen-Stine Bootstrap $\chi^2 161.9$, $df 145$, $p 0.03$, $\chi^2/df 1.1$, GFI 0.83, AGFI 0.78, CFI 0.63, RMSEA 0.075).

Выводы: 1. На материале точностных показателей задач на переработку нейтральной и эмоционально окрашенной информации

выделяются факторы аналитического и холистического способов переработки. 2. Фактор аналитической переработки положительно связан с фактором тестового общего интеллекта, в то время как фактор холистической переработки – с фактором тестового эмоционального интеллекта. Сила связи в первом случае существенно ниже силы связи во втором случае. 3. Факторы аналитического и холистического способов переработки информации не образовали связи с тестовой креативностью.

Примечания:

1. Все показатели методик на переработку информации являются точностными, оценивались для условий ответов «да» и «нет» в холистической и аналитической серии (ХС и АС).

2. Названия методик: ВЛ – «Восприятие лиц»; СС – «Социальные ситуации»; ЗН – «Задача Навона».

3. Расшифровка аббревиатур рисунка: FHN – ВЛ, ХС, «нет»; NGCf – ЗН, ХС в конфликтных условиях; NGCg – ЗН, ХС в неконфликтных условиях; SHY – СС, ХС, «да»; SHN – СС, ХС, «нет»; FHY – ВЛ, ХС, «да»; NLCf – ЗН, АС в конфликтных условиях; NLCg – ЗН, АС

в неконфликтных условиях; SA – CC, AC; FAY – ВЛ, AC, «да»; FAN – ВЛ, AC, «нет»; PrIQ_delta – тест практического интеллекта; VideoR – видеотест; Ist – Тест Амтхауэра; Rat – тест отдаленных ассоциаций; Raven – ППМ;

Guilford – тест Гилфорда; Urban – тест Урбана; PrConseq – тест Торранса.

Исследование поддержано грантами РГНФ № 11-36-00342a2, №11-36-00226a1

СПЕЦИФИКА ПОРОЖДЕНИЯ ЮМОРИСТИЧЕСКОГО ЭФФЕКТА В ПОЛИКОДОВОМ ТЕКСТЕ

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1. В настоящем докладе ставится задача выявления особых возможностей поликодового текста в создании юмористического эффекта. В оценке механизма создания искомого эффекта мы присоединяемся к мнению таких авторитетных исследователей, как М. Минский (Minsky 1980), В. Раскин и С. Аттардо (Attardo, Raskin 1991) и др., усматривающим в качестве его основы конфликт/контраст между когнитивными представлениями одной и той же ситуации. Эти представления могут соотноситься с когнитивными единицами разных уровней, в связи с чем, прежде чем продолжить наше рассуждение, необходимо уточнить рабочее понимание некоторых базовых терминов, отличающихся неоднозначностью в когнитивной науке:

а. Под концептом мы будем понимать минимальную когнитивную единицу, дискретную когнитивную сущность;

б. Под фреймом, в соответствии с изначальным значением термина (ср. англ. *frame* – *кадр*), – совокупность концептов, объединяемых в единую ситуацию, способ организации концептов (Никитин 2005);

с. Под сценарием – последовательность фреймов, фиксированную регулярным повторением, нормативным требованием или конкретным текстом.

д. Приведенная иерархия не вполне согласуется с более распространенным представлением о фрейме как разновидности сложного многокомпонентного концепта (см. Болдырев 2000; Попова, Стернин 1999), но выигрывает в отношении однозначности терминологии и позволяет избежать определений концепта через концепт.

1. В основе юмористического эффекта нередко лежит контраст между речевыми презентациями одной и той же ситуации, относимыми к разным дискурсам. Т.е. дискурс персонажа

задает ему способ восприятия и вербализации ситуации.

2. Е. g. («Шрек». Сдача сказочных существ властям).

Представитель властей: Next. What have you got?

Старик Джипетто: This little wooden **puppet**.

Пиноккио: I am not a puppet. I am a real **boy**.

Представитель властей: 5 shillings for the **possessed toy**.

В данном примере можно наблюдать столкновение театрального и реалистического дискурсов на вербальном уровне, дополняемое волшеббно-сказочным на невербальном уровне.

3. Отличительной чертой поликодового текста является сочетание в нем более чем одного семиотического кода, элементы каждого из которых являются актуализаторами когнитивных структур, лежащих в основе текста. Наиболее типична ситуация согласованности разнокодовых компонентов. Однако именно их рассогласованность, маркированная как нарушение когерентности поликодового текста, нередко используется для порождения юмористического эффекта. Так, фоновый сказочный дискурс «Шрека» нарушается вторжением инодискурсных элементов:

а) на вербальном уровне

Е. g. By the order of Lord Farquaad I am **authorized** to place you both **under arrest** and **transport** you to a **designated resettlement facility** (властный официальный дискурс в обращении солдат лорда Фаркуада к Шреку);

Е. g. (Осел о месте обитания Шрека) Oh, you are quite a **decorator**. Amazing what you've done with such a **modest budget** (бытовым реалистическим полидискурсом в речи Осла)

б) на невербальном уровне

Е. g. Конфликт дискурса волшебной сказки, актуализируемого на вербальном уровне воспроизведением текста сказки о принцессе Фионе, с типичной для данного дискурса супер-и макроструктурой, и сниженного бытового дискурса на невербальном уровне (Шрек сидит

в туалете и использует лист из книги как туалетную бумагу).

Во всех приведенных примерах в основе юмористического эффекта лежит явление интердискурсивности, т.е. введения элементов разных дискурсов.

4. Юмористический эффект может быть также вызван расслоением текста на когнитивном уровне как следствие введения инотекстовых элементов (интертекстуальности). Прецедентными текстами являются также поликодовые тексты (продукты кинематографа и мультипликации). Оpozнание инотекста опирается на видео- и музыкальные коды (напр., музыкальная тема из кинофильма «Апокалипсис сегодня» в мультипликационном фильме «Ранго» как фон для эпизода атаки кротов на летучих мышах отсылает к визуально сходному эпизоду атаки на вертолетах в фильме-доноре).

Маркером интертекстуальности также часто является прецедентный персонаж (Пинокио, говорящее зеркало, Белоснежка, Рапунцель, Спящая Красавица, три поросенка, Робин Гуд и его лесные братья и др. в мультипликационном

фильме «Шрек»). При этом юмористический эффект связан с эффектом обманутого ожидания при нарушении в тексте-приемнике сценария, зафиксированного текстом-донором.

5. В заключение подчеркнем, что в создании юмористического эффекта поликодовый текст располагает более широким спектром средств, нежели традиционный вербальный текст. Своеобразное преломление получают явления интертекстуальности и интердискурсивности, маркерами которых могут выступать элементы как вербального, так визуального и музыкального кодов.

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ЭМОЦИОНАЛЬНЫЕ И ВЕРБАЛЬНЫЕ ОЦЕНКИ В МЫСЛИТЕЛЬНОЙ ДЕЯТЕЛЬНОСТИ

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В психологии достаточно давно сложились представления о единстве эмоциональной и мыслительной активности. В исследованиях О. К. Тихомирова и его учеников (Тихомиров, 2002) было показано, что решение мыслительной задачи зарождается на неосознаваемом уровне, благодаря эмоциям фиксируется зона поиска и направление деятельности, изменяется объем исследовательской активности. В. Е. Ключко показал, что «психологическая ситуация» является источником новообразований и трансформаций мыслительной деятельности (Ключко, 2002).

Мы предполагаем, что гипотезы решения мыслительной задачи, соответствующие активной, ценностно-смысловой структуре психологической ситуации, обретают смысл и вписываются в образ мира человека. При этом эмоции презентуют человеку смысл данной гипотезы как правильной, истинной. В случае, если гипотеза была оценена как неправильная, она попадает в потенциально активную область

психологической ситуации как несоответствующая ценностно-смысловой структуре. По ходу решения мыслительной задачи ценностно-смысловая структура может меняться, что приводит к переосмыслению отвергнутой ранее гипотезы или появлению новых гипотез. При этом новая гипотеза открывается человеку в форме эмоциональной оценки. Полученный эмоциональный сигнал переживается человеком как значимый, но это ещё не означает, что гипотеза решения будет осознана. Человек может так никогда и не осознать возникшую эмоцию и гипотезу решения, которая снова «уйдет» в потенциально активную область как неустраиваемая. Для того, чтобы гипотеза была понята и принята как правильная, человеку необходимо отразить поступившее эмоциональное переживание и вербализовать его. Отраженное содержание эмоционального переживания проявляется в вербальных оценках, выражающих новые смыслы новых гипотез.

Эмоции являются состояниями, которые лежат на границе сознания, за его пределами, поэтому смыслы предметов, выраженные в эмоциональных оценках, еще должны быть представлены самому человеку. Это происходит

через вербализацию смыслов. Человек переживает, «чувствует», что нашёл правильное решение, это проявляется в интеллектуальных эмоциях близости решения (Тихомиров, 2002), но не может «опредметить» свое переживание. Это означает, что человек чувствует, что нашёл то, что нужно, но что это – он не может сказать, т.е. не может найти предмет, значение, выраженное в понятии, с помощью которого он может опредметить своё переживание и обозначить обретенные смыслы. И нужна рефлексия процесса мышления, с помощью которой человек находит значение и вербализует смыслы.

Для доказательства выдвинутых предположений под нашим руководством было проведено исследование О. А. Коронцевичем с использованием оборудования психофизиологического реабилитационного комплекса «РЕАКОР». Были использованы задачи из тестов Айзенка и прогрессивные матрицы Равена. В процессе решения испытуемыми задач фиксировались: гипотезы решения на этапе предъявления условия задачи; изменения кожного сопротивления (кожно-гальваническая реакция); вербальные оценки предъявляемых вариантов решения задачи; эмоциональный компонент вербальных оценок; варианты решения.

Результаты экспериментального исследования показали следующее:

- Эмоциональные оценки гипотез решения мыслительной задачи отражают их смысл с точки зрения познавательного мотива, т.е. отражают попадание гипотез решения в «зону поиска» решения мыслительной задачи. На данном эффекте основан механизм субъективной оценки истинности выдвигаемых гипотез. Эмоциональные оценки, отражая истинность осознаваемой гипотезы решения мыслительной задачи, защищают гипотезу от опровержения. При этом эмоциональные оценки выполняют констатирующую и подтверждающую функции в мыслительной деятельности.

- В ходе мыслительной деятельности возникают познавательные противоречия, которые связаны с формирующимися на неосознаваемом уровне альтернативными гипотезами. Эмоциональные оценки выступают «локомотивом», с помощью которого человек осознаёт гипотезы с точки зрения решения мыслительной задачи, способствуют переходу новых смыслов осознаваемых гипотез из потенциально активной в активную область психологической ситуации. При этом эмоциональные оценки «проталкивают» в сознание новые гипотезы решения мыслительной задачи, актуализируя познавательные противоречия, выполняя

эвристическую функцию в мыслительном процессе, меняя его направленность.

- Вербальные оценки в мыслительной деятельности являются производными от ценностно-смысловой структуры мыслительной задачи. Новые смыслы гипотез решения мыслительной задачи презентуются человеку в виде эмоциональных оценок, которые приводят к изменениям ценностно-смысловой структуры мыслительной задачи и к преобразованиям характера вербальных оценок. Смыслы вербализуются и презентуются человеку в форме словесных оценок. Таким образом, эмоциональные оценки, в случае, если они выполняют эвристическую функцию, предшествуют вербальным оценкам, подготавливая их появление. В вербальных оценках представлен смысл решения мыслительной задачи с точки зрения познавательного мотива.

- Было показано, что вербальные оценки подготавливаются эмоциональными, но могут и не совпадать, диссоциировать. В мыслительной деятельности возникают факты согласованности и рассогласованности эмоциональных и вербальных оценок, которые основаны на их многозначной связи. Согласованность оценок возникает тогда, когда эмоциональные оценки выполняют функции подтверждения осознаваемой гипотезы. В этом случае эмоциональные и вербальные оценки являются производными от одной ценностно-смысловой структуры мыслительной задачи, при этом они не находятся в причинно-следственных связях. В случае, когда эмоциональные оценки выполняют эвристическую функцию, они являются производными от новой ценностно-смысловой структуры мыслительной задачи, а вербальные оценки – производными от предыдущей ценностно-смысловой структуры мыслительной задачи, возникает факт рассогласованности оценок.

Таким образом, полученные результаты позволяют утверждать, что эмоциональные оценки выступают одним из психологических механизмов, посредством которого новое – в виде новых смыслов, гипотез, целей, оценок, решений – приходит к человеку. Возникающие новообразования несут в себе возможности перестройки и трансформации ценностно-смыслового содержания сознания человека, которые, будучи воплощены, меняют жизненную ситуацию, жизненный мир, способствуя развитию и самореализации человека.

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МЕНТАЛЬНАЯ РЕПРЕЗЕНТАЦИЯ АСПЕКТОВ ВАХТОВОГО ТРУДА У СОЦИАЛЬНО АДАПТИРОВАННЫХ РАБОЧИХ

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Излагаются результаты пилотажного этапа экспедиционного исследования профессиональной адаптации вахтовых рабочих, связанные с социальными проблемами. Образы объекта, субъекта и условий труда выполняют регулирующую функцию, поэтому актуально выявление специфических особенностей ментальной репрезентации вахты у тех вахтовых рабочих, которые отличаются более эффективными адаптивными стратегиями. Процесс профессиональной адаптации является сложной системой, в особенности если речь идет об адаптации в экстремальных условиях Крайнего Севера, где сохранение функционального состояния на уровне нормы требует подчас несоизмеримых с результатом затрат. До сих пор изучались либо медико-физиологические процессы адаптации, либо личностно-психологические, при этом управление этими процессами также решалось либо в физиологической, либо в личностно-психологической парадигме. Однако по мере развития когнитивных наук все большее значение приобретают когнитивные механизмы эффективной профессиональной адаптации, при этом для вахтовых рабочих они играют особую роль, поскольку все остальные средства уже фактически исчерпаны, а уровень утомления и нарушений адаптации продолжает оставаться высоким. Основную регулирующую нагрузку несут пространственно-временные аспекты ментальной репрезентации (С. Л. Белых, 2008; Н. Н. Симонова, 2010).

В рамках метаадаптивного подхода (Н. Н. Симонова, 2011) предлагается управление функциональным состоянием для сохранения необходимого уровня работоспособности с помощью диверсификации ментальных схем. Причем, предположительно, результат должен проявиться как на психологическом, так и на физиологическом уровне.

На пилотажном этапе ставилась задача апробации инструментария для диагностики ментальных репрезентаций вахты и различных аспектов жизни и деятельности вахтовых рабочих. Выборка составила 59 человек, измерения производились в экспедициях на буровых Тэдинка, Уренгой, Тобой ОАО Лукойл (Ненецкий

автономный округ). Использовались: методика мотивационной структуры личности Мильмана, методика изучения социально-психологического климата, САН, методика изучения копинг-стратегий преодоления стресса Д. Амирхана, тест социально-психологической адаптированности Даймонда-Роджерса, тест УСК Е. Ф. Бажина, Е. А. Голынкиной, Л. М. Эткинда, методика В. И. Моросановой «Стиль саморегуляции поведения» (ССПМ).

Также проводились две психосемантические методики (решетки). Для этих решеток специально выявлялись объекты оценивания и оценочные шкалы на целевой выборке вахтовых рабочих. В контексте теории Дж. Келли это будут «заданные» элементы и конструкты (Ф. Франселла, Д. Баннистер, 1987). С помощью стандартного семантического дифференциала Ч. Осгуда (12 шкал) испытуемыми оценивались следующие объекты: 1. Период вахты; 2. Я в межвахтовый период; 3. Моя жизнь; 4. Север вообще; 5. Семья; 6. Середина вахты; 7. Я с теми, кого люблю; 8. Моя среда обитания на вахте; 9. Дом вообще; 10. Малая Родина; 11. Результат в конце вахты; 12. Я дома занимаюсь делами; 13. Моя бригада (отдел, команда, звено и др.); 14. Я с теми, кто мне не нравится; 15. Страна (Россия); 16. Я общаюсь дома; 17. Я общаюсь с коллегами; 18. Начало вахты; 19. Я на вахте работаю; 20. Моя среда обитания дома.

Кроме того, пять объектов (вахта, межвахтовый период, начало вахты, середина вахты, конец вахты) оценивались с помощью шкал: позволяет расслабиться – требует напряжения; требует усилий – легко дается; и глупому доступно – требует знаний; с этим справится любой – требует умений; дает хорошее настроение – снижает настроение; влияет на будущее – не влияет на будущее; делает слабее – делает сильнее; придает энергии – утомляет; ведет к деградации – развивает; вызывает гнев – вызывает страх; вызывает радость – вызывает отвращение; надоедает – не надоедает; способствует самоуважению – вызывает стыд; вызывает чувство вины – дает успокоенность; не требует ответственности – требует ответственности; актуально для меня – могу обойтись без этого; не влияет практически ни на что – влияет на все события моей жизни; делает свободным – делает зависимым; мешает жизни – помогает жизни.

Для задействования визуальной сферы испытуемым предложено было выбрать метафорический образ, который ассоциируется с

расстоянием, отделяющим их от дома, и образ, ассоциирующийся с тем, какая связь соединяет их с близкими людьми (из нескольких вариантов в картинках). Для выбора метафоры расстояния были картинки «ширма», «космос», «бездна», «горы», «стена», «увеличительное стекло», «уменьшительное стекло» (или нарисовать свою картинку). Для метафоры связи это были картинки «цепи», «мост», «клубок», «замок», «флюиды», «канат», «стержень металлический» (или нарисовать свою картинку).

У всех испытуемых выявляли личные данные – возраст, общий стаж работы, стаж работы вахтовым методом, стаж работы по специальности, количество вахт в год, длительность вахт, семейное положение, место жительства, количество человек в семье и количество детей, а также материальное положение (по субъективной оценке). Для статистической обработки использовались кластерный, факторный анализ, сравнение по U-критерию Манна-Уитни, проекция (построение семантического пространства).

Были получены результаты, позволившие дать развернутые характеристики различных адаптивных стратегий и соответствующих им

ментальных репрезентаций. Для отражения расстояния большинство вахтовиков выбрали образ «горы», а для отражения связи – образ «мост».

Особый интерес представляют семантические пространства, построенные на основе обеих решеток. В каждом из них выявилось одно и то же противоречие: оценка вахты и межвахтового отдыха практически во всей выборке в целом позитивная и расслабленная, но оценка отдельных ее аспектов и этапов – напряженная, требующая высокой ответственности, утомляющая.

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ИССЛЕДОВАНИЕ ИНДИВИДУАЛЬНЫХ ОСОБЕННОСТЕЙ ВОСПРИЯТИЯ ИЗОБРАЖЕНИЙ ПРИ ПОМОЩИ ФРАКТАЛЬНОГО АНАЛИЗА ТРАЕКТОРИИ ДВИЖЕНИЯ ГЛАЗ

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Введение. В настоящее время проблема создания эффективных информационных технологий, учитывающих особенности когнитивных процессов, является особенно актуальной. При анализе графической информации с экранов мониторов в сложных технологических системах огромную роль играют процессы зрительного восприятия, распределения внимания, стратегий зрительного поиска, принятия решения оператора. Указанные когнитивные процессы могут проявляться в особенностях движений глаз. В многочисленных исследованиях было показано, что временные и пространственные характеристики движения глаз позволяют оценить сложность познавательного процесса, динамику его развития, его характерные особенности (Ярбус

1967; Величковский 2003; Барабанщиков 1997). В последнее время было предложено несколько моделей, в которых высказываются гипотезы о том, какие факторы являются определяющими для траектории движения глаз. Некоторые модели (Itti and Koch 2000), которые называются моделями восходящих процессов (bottom-up models), предполагают, что движения глаз определяются простыми зрительными признаками изображения – яркостью, цветом, контрастом, движением. Другие модели, называемые моделями нисходящих процессов (top-down models), предполагают, что движения глаз зависят от того, «что» и «где» наблюдатель ожидает увидеть, решая какую-либо когнитивную задачу (Torralba et al. 2006).

Традиционными параметрами, при помощи которых производится оценка успешности выполнения когнитивных задач, являются число, продолжительность и локализация фиксаций, скорость и продолжительность саккад, пространственное распределение ориентаций саккадических скачков, пространственно-временная последовательность фиксаций, наличие и число регрессионных движений. Однако

указанные параметры не всегда эффективны для оценки динамики сложных когнитивных процессов, а также в задачах оценки индивидуальных различий восприятия изображений. В связи с этим возникает необходимость поиска новых методов анализа движения глаз, которые были бы более адекватны для исследования сложных когнитивных задач, а также более чувствительны к индивидуальным особенностям зрительного восприятия. Ранее было высказано предположение, что динамические характеристики живых систем можно эффективно описывать в терминах теории нелинейного динамического хаоса (Mandelbrot 1982). К биологическим системам, которые рассматривались как фрактальные объекты, относили биологические ритмы, динамику нейронных популяций, а также траекторию движения глаз. Одним из основных параметров фрактального анализа (ФА) является фрактальная размерность (ФР), которую можно рассматривать как меру упорядочивания динамических процессов по степени хаотичности. В нашем исследовании была предпринята попытка использовать ФА траектории движения глаз для изучения особенностей восприятия различных по сложности изображений.

Задачи исследования. Задачей нашего исследования являлась оценка чувствительности ФА траектории движения глаз в задачах: 1) распознавания при различном соотношении сигнал/шум, 2) оценки индивидуального стиля восприятия сложных изображений, а также 3) оценки профессиональной подготовленности наблюдателя. Предполагалось, что ФА позволит выделить количественные характеристики для оценки эффективности процессов зрительного восприятия во всех указанных типах задач.

Испытуемые. В эксперименте принимали участие 18 человек (11 девушек 7 юношей) в возрасте от 17 до 25 лет с нормальным или скорректированным зрением.

Стимулы. Использовались 12 различных по сложности стимулов – случайно-точечные паттерны, изображение лица человека в обычной и перевернутой ориентации, пейзажи, изображения предметов искусства.

Аппаратура. Движения глаз регистрировались при помощи установки iView X (версия 1.3) немецкой фирмы SMI GmbH.

План эксперимента. Эксперимент состоял из 3-х серий. В 1-й серии регистрировались движения глаз в задаче восприятия изображения (цифры, лицо человека), предъявленного на фоне шума с различным отношением сигнал/шум. Во 2-й серии – в задаче зрительного восприятия различных по сложности изображений – шум,

лицо, инвертированное лицо, пейзаж. В 3-й серии – в задаче восприятия изображений произведений искусства наблюдателями с различной (высокой, средней, низкой) искусствоведческой подготовкой.

Результаты. На основе полученных траекторий движений глаз проводился расчет ФР для каждого наблюдателя и каждого изображения. Для этого многократно просматривалась длина траектории движения глаз с использованием измерительного элемента L, размер которого при каждом следующем проходе по длине записи уменьшается с заданным шагом. Для каждого прохода определялось отношение значения вычисленной длины к реальной длине траектории движения глаз. В результате каждая траектория движения глаза (трек) отображалась в виде некоторой сходящейся функциональной зависимости (ФР vs L), хорошо аппроксимируемой наклонной линией.

Выводы.

Анализ полученных зависимостей показал, что при увеличении отношения сигнал/шум хаотические движения глаз становятся упорядоченными – они либо повторяют простую форму изображения, либо выделяют его наиболее информативные точки. Следует отметить, что именно такой тип поведения характерен для фрактальных объектов. Полученные кривые показали высокую чувствительность метода ФА к индивидуальным особенностям просмотра изображения. Характеристики функциональной зависимости ФР vs L позволили определить, *кто* смотрит на изображение, *на какое изображение* он смотрит, а также насколько он *профессионально подготовлен* для просмотра сложного изображения (на примере восприятия изображений произведений искусства).

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The study of individual features of visual perception using fractal analysis of eye tracking.

ЧЕМ ОТЛИЧАЕТСЯ «ПОНИМАНИЕ» ОТ «ЗНАНИЯ»?

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Основным направлением исследований когнитивной науки являются информационные процессы, преобразование информации в ходе познавательной деятельности, формирование и использование знаний. Однако в рамках когнитивного направления как мультидисциплинарной науки существует значительная неопределённость в терминах. Так, не всегда чётко разграничивают понятие перцептивных данных и знаний, предлагаются различные варианты представления самих знаний (скрипты, фреймы, пропозиции, образы) и, наконец, неясным остаётся механизм использования знаний – является ли наличие знаний самодостаточным или необходим дополнительный процесс, приводящий к «пониманию» приобретенных знаний. Анализ вопроса о знании и понимании можно встретить уже в классических психофизиологических работах И. М. Сеченова (1878), в которых набор ассоциаций, приобретаемых *пассивно*, он выделял в качестве исходного знания. И только в случае *активного* отношения человека к полученным знаниям через оценку их значимости и ценности в результате аналитико-синтетического процесса (опыта) приходит понимание приобретенных знаний и возможность их целенаправленного использования при организации поведения. Однако последующие концепции в рамках психофизиологии и физиологии высшей нервной деятельности, сосредоточившиеся в основном на анализе обучения, далеко ушли от этих представлений. Так, в рамках современной классификации обучения (Зорина, 2002), ассоциативные и когнитивные процессы выделяются как отдельные типы. В связи с этим в работе предпринята попытка оценить на основе использования системно-информационного подхода (Никольская, 2010) роль ассоциативного и аналитико-синтетического процессов при формировании целенаправленного поведения.

Исследование проводилось на мышах линии BALB/c. Использовалась оригинальная модель пищедобывательного поведения в многоальтернативном лабиринте по методике свободного выбора (Никольская, 2010), уровень пищевой депривации составлял 24 ч. Для решения предложенной задачи животным требовалось несколько опытов, в ходе которых было необходимо выявить закономерности функционирования оперантных элементов среды и на основании

них организовать своё поведение. Всем элементам среды присваивались символы, за счёт чего регистрация поведения животных осуществлялась в виде символьных последовательностей, отражавших всю историю познавательной деятельности. В ходе обработки данных проводился частотный анализ последовательностей, состоящих из 1, 2, 3... n действий, вычислялась вероятность перехода между отдельными знаками и вероятность выполнения последовательностей, соответствующих целостному решению.

Опыты с мышами линии BALB/c из питомника «Столбовая», проводившиеся с интервалом в 48 ч, позволили выявить следующие когнитивные этапы в ходе обучения. В первую очередь происходила ориентация в пространстве и выделение семантических узлов (значимых элементов), однако этого оказывалось недостаточно для формирования целенаправленного поведения. Чётко выделялась стадия эфферентной генерализации, в ходе которой животные порождали значительное разнообразие символьных последовательностей – комбинаций значимых элементов – и уже на основе оценки порождаемых вариантов (аналитико-синтетического процесса) в дальнейшем осуществлялась организация поведения. Если начальный этап ориентации в пространстве занимал 1–2 опыта, последующие процессы, несмотря на возможность быстрого получения подкрепления, были более длительными. В результате для формирования поведения, соответствующего решению задачи, животным требовалось в среднем 13–16 опытов. Сформированное поведение тестировалось на свойство адаптивности – на пути предпочитаемой маршрутной реализации в лабиринте ставилась перегородка, при этом оставалась возможность реализовать его через альтернативные, ранее апробированные, маршрутные варианты. Способность данных мышей «с места» перестроить своё поведение – свойство *адаптивности* – предполагает наличие внутреннего плана поведения, на уровне подцелей, инвариантного по отношению к конкретной маршрутной реализации. Только такое поведение может быть определено как целенаправленное. Неожиданные данные были получены в эксперименте, проведённом по той же схеме с мышами BALB/c из вивария НИИ Канцерогенеза. Выяснилось, что несмотря на сходную динамику ориентации в пространстве и выявления семантических элементов, этап порождения разнообразия связей отсутствовал. Это отразилось на качестве поведения: животные демонстрировали пищевое, но

не формировали пищедобывательного поведения. Интересно, что последовательность, соответствующая целостному решению, стабильно встречалась в каждом опыте, но её значимость – вероятность возникновения в опыте – не показывала положительной динамики. Однако, как только межопытный интервал у данной группы был изменён с 48 ч на 24 ч, данная структура уже в течение 2 опытов скачкообразно проявилась с высокой значимостью. Этот феномен поставил вопрос о роли межопытного интервала для познавательной деятельности и была проведена серия с такими же животными, но межопытным интервалом в 24 ч. Оказалось, что эти мыши быстро (уже в течение 5 опытов) формировали стереотипное поведение, соответствующее по структуре решению предложенной задачи. Однако информационный анализ показал, что в ходе познавательной деятельности они также порождали удивительно малое разнообразие символьных последовательностей (12 ± 1 разных 4 грамм против 27 ± 2 у мышей из «Столбовой») и сразу объединяли их в длинную последовательность, совпадающую по своей структуре с предложенным решением. Тест на адаптивность показал, что при столкновении с преградой данные животные не могли перестроить своё поведение на альтернативные, ранее апробированные варианты, а значит, в данном случае можно говорить о жёстком поведенческом шаблоне, использовании ассоциаций без их оценки. В то же время целенаправленное поведение

предполагает наличие плана действия, построенного на основании аналитико-синтетического процесса – апробирования и оценки различных вариантов. Несмотря на сходную «внешнюю», поведенческую структуру, содержание, внутренняя структура здесь абсолютно разная – ведь только целенаправленное поведение отражает «понимание», поскольку формируется на основе выявления причинно-следственных связей. Полученные данные свидетельствуют о том, что поведение, сформированное на основе одних лишь «знаний» – ассоциаций – через их шаблонное использование, может в некоторых случаях являться *адекватным*, но будет лишено *целенаправленности*. Оценивая с точки зрения «понимания», такое поведение может быть описано как имитация. Каковы же критерии отличия «знания» от «понимания»? С точки зрения И. М. Сеченова, ключевым моментом здесь является активный аналитико-синтетический процесс, противопоставленный пассивному процессу приобретения «знаний». Таким образом, отличить «понимание» от имитации мы сможем, только зная динамику, историю познавательной деятельности и чётко разделяя активные и пассивные процессы.

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О КОГНИТИВНОЙ ПРИРОДЕ ЯЗЫКА ПРОФЕТИЧЕСКИХ ТЕКСТОВ

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Новыми объектами современной когнитивной лингвистики выступают знаковые сущности, содержательно ориентированные на некую «иную действительность», трансцендентную обычному языковому сознанию, находящуюся за пределами бытового понимания и постигаемую лишь в отдельных ее составляющих. В психоанализе З. Фрейда и аналитической психологии К. Г. Юнга эта действительность определяется как *Бессознательное*. Средством выражения содержаний Бессознательного служат образы, символы, организующиеся в символические тексты посредством особого языка, который отличается от естественного языка по

многим параметрам. «Язык символов, – писал по этому поводу Э. Фромм, – это тот язык, который позволяет внутренний опыт, ощущения, переживания и мысли выразить в той же мере, что и события внешней реальности. У этого языка другая логика, отличная от той, которой мы пользуемся в повседневном общении...». Цель доклада – показать когнитивную специфику языка пророчеств, наиболее отчетливо проявляющуюся в трансцендентности его категорий естественному языку.

«Иной действительностью» для человека является будущее. По закону когнитивного освоения времени оно мыслится на основе событий, но его события ирреальны, до определенного момента существуют лишь в человеческом сознании. Будущее неизвестно человеку, не актуально для него, но, тем не менее, человек думает о его событиях и при этом мыслит их

как неизбежность, которая допускает лишь некоторое влияние на себя, но в целом подчиняет себе человека. Ср. в русской лингвокультурной традиции: *Чему быть, того не миновать; Чему быть, тому и стать; Как чему быть, так и быть; Что будет, то будет, того не минуешь; Коли быть беде, то ее не минуешь; Бойся не бойся, а року не миновать; Бойся не бойся, а от части своей (от участи) не уйдешь*. Сфера развертывания событий будущего – реальность настоящего, но как таковое будущее существует лишь в человеческой ментальности. События будущего не принадлежат реальному бытию, но как бы заранее существуют, потому что с абсолютной неизбежностью осуществляются в настоящем, а потом сохраняют себя в памяти о прошлом. Онтологическая парадоксальность будущего, его ирреальность, поддерживаемая парадоксальностью его когнитивной структуры, дает основание полагать, что столь же необычным является и язык, на котором изложены тексты о нем.

На таком языке изложены профетические тексты – дискурсивные образования, в которых представляются знания человека о событиях будущего, со временем получающие подтверждение в реальности. Характерную черту этого языка составляет семантическая неопределенность его отдельных единиц, обусловленная особой масштабностью соответствующих категорий, выходом их за рамки собственно языковых содержаний. Это обстоятельство сближает подобные единицы с символическими формами, для которых также характерна содержательная масштабность и многомерность.

С точки зрения внешних функциональных свойств языка масштабность подобных профетических категорий проявляет себя как

характерная «зонность» соотносимых с ними референтов. Механизмы референтной неопределенности соответствующих слов в пророчествах разнообразны. Это может быть неразличение имен собственных и имен нарицательных – одни и те же лексемы используются для обозначения в референтной сфере и строго индивидуальных объектов, и их классов. Это может быть также более общая позиция в плане отношений диалектного родства – ориентированность на более широкое в пространственном плане языковое состояние внутри конкретного языка. Референтная неопределенность языка пророчеств обуславливается также неразличением не только междиалектных, но и межязыковых лексических параллелей, откуда следует, что язык пророчеств вообще «центробежен» – ориентирован на возможно более широкое языковое состояние, границы которого имеют, однако, относительный характер. В языке пророчеств наблюдается использование эпитетов, значимых для неопределенно широкой референтной зоны, – т.е. неопределенно широких по своей «сильной» семантике. Эти и некоторые другие функционально знаковые особенности языка пророчеств могут стать основанием для дальнейших типологических обобщений в данной сфере.

В целом в докладе будет доказываться положение о том, что глубинные категории человеческой ментальности более масштабны и в функционально-знаковом отношении более неопределенны по сравнению с сущностями поверхностно-языкового уровня. И в этом смысле они трансцендентны категориям языка. Это и есть «Невысказываемое», которое, согласно Л. Витгенштейну, само раскрывает себя в образе.

ЦЕННОСТНАЯ ДЕТЕРМИНАЦИЯ ПРОФЕССИОНАЛЬНОЙ НАДЕЖНОСТИ

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Проблема обеспечения профессиональной надежности, как одна из основных задач психологии труда, наибольшее значение приобретает в профессиях, связанных с повышенными требованиями к человеку, экстремальностью условий, ответственностью, высокой ценой ошибки, риском для здоровья и жизни. Пришедшее из технических наук, понятие надежности традиционно

представляется комплексным. Применительно к профессиональной деятельности человека, надежность также рассматривается как интегральное системное качество. Основными показателями надежности считались критерии безотказности, безошибочности работы в определенных условиях в течение заданного периода времени с заданными показателями эффективности (Никифоров 1991: 134–135, Губинский 1882 и др.). Несомненна роль условий труда: как отмечает Небылицын 1990, проблема надежности может возникать только в условиях экстремальных,

необычных, напряженных, предъявляющих повышенные требования к личности специалиста. Закономерно включение в понятие надежности характеристик самой личности работающего человека, способности сохранять требуемую эффективность труда и требуемых рабочих качеств в условиях возможного усложнения обстановки (Завалова, Ломов, Пономаренко 1971: 23–24). В связи с этим выделяется понятие функциональной надежности как свойства функциональных систем человека обеспечивать его динамическую устойчивость в выполнении профессиональной задачи в течение определенного времени и с заданным качеством. (Бодров, Орлов 1998: 36). Сложность понятия надежности обуславливает необходимость ее системного анализа. Одним из наиболее привлекательных подходов к изучению надежности является ее рассмотрение также с точки зрения ресурсного подхода, который является удобной метафорой для отражения цены деятельности и позволяет оценить также психические, психофизиологические, психологические «затраты» субъекта труда.

Методики: шкала стресса PSM-25, Дифференциальная диагностика состояний сниженной работоспособности ДОРС (Леонова А.Б., Величковская С.Б.), Хроническое утомление (Леонова А.Б.), Личностная тревожность (Ч. Спилбергер), Диагностика профессионального выгорания (К. Маслач), тест Ш. Шварца и Р. Билски для изучения ценностей, Методика исследования самооотношения (МИС) В.В. Столина и С.Р. Пантелеева, «Шкала базисных убеждений» Р. Янов-Бульман, Фрайбургский личностный опросник FPI. Работоспособность и безошибочность оценивались с помощью методики ЧКТ. Психофизиологические затраты оценивались по показателям частоты сердечных сокращений (ЧСС) и оксигенации крови.

Обследованный контингент – летчики, 114 чел.

Проведена дифференциальная оценка вклада функциональных состояний, личностных особенностей, условий труда в обеспечение профессиональной надежности. Установлено, что надежность деятельности и особенности реагирования организма, психофизиологическая «цена», связаны с различными психологическими качествами. Так, со скоростью выполнения умственной работы в наибольшей степени взаимосвязаны типологические особенности индивида, а также личностные качества, среди которых наибольшее значение имеют: спонтанная и реактивная агрессивность ($p=0,007$), общительность (0,02), экстраверсия (0,003), маскулинность (0,02).

Влияние функциональных состояний субъекта труда более выражено и более системно, однако они сказываются не столько на точности и скорости работы, сколько на «психофизиологической цене» деятельности, что подчеркивает роль ФС в обеспечении надежности и значимость их в доклинической диагностике снижения пригодности. Подтверждением может служить тот факт, что выгорание (редукция профессиональных обязанностей), личностная тревожность, уровень стресса, утомление (эмоционально-аффективные реакции, физический дискомфорт, снижение мотивации общения при утомлении) положительно связаны с ростом ЧСС, а все те же состояния плюс снижение удовлетворенности, наличие состояний монотонии и пресыщения способствуют снижению содержания кислорода в крови. Таким образом, негативные функциональные состояния способствуют истощению ресурсов организма, что, в свою очередь, должно еще более усиливать данные состояния, например, в виде прогрессирующего утомления.

Установлено, что результативные показатели надежности и ее «психофизиологическая цена» наиболее сильно обусловлены ценностно-мотивационными особенностями личности человека. Регрессионный анализ позволил установить ценностные детерминанты надежности. Наибольшее значение для обеспечения результативных показателей надежности имеет высокая значимость для личности ценностей «достижения» (индекс в уравнении регрессии 35,0), «доброта» (22,3), «самостоятельность» (9,1), «стимуляция» (3,3), в то время как показатели функционального состояния гораздо менее значимы: общительность (6,4), открытость (3,5) и т.д. Отрицательно на надежности сказывается высокий уровень ценностей «безопасность» (21,7), «конформность» (21,5), «власть» (17,6), «традиции» (3,8), а также потеря уверенности в контролируемости мира по Р. Янов-Бульман (12,3) и справедливости (11,1), и только потом – стресс (6,1), утомление (2,7), физический дискомфорт (0,4). Данные ценности входят в одну из трех базовых категорий субъективного мира человека, а именно веру в то, что в мире больше добра, чем зла. Здоровое чувство безопасности и уверенности в самом себе являются базовыми ощущениями нормального человека. Полученный в исследовании результат подтверждает, что расходование ресурсов есть результат не только и не столько необходимости активизации, поддержания состояния alertности в процессе деятельности, сколько особенностей ценностно-детерминированного

отношения, представления о враждебности мира и необходимости противостояния ему.

Итак, результирующие показатели надежности (скорость и безошибочность) в большей степени взаимосвязаны с личностными особенностями субъекта труда, прежде всего с типологическими особенностями нервной системы, а также частично детерминируются направленностью на результат. Результативность работы слабо коррелирует с психофизиологическими затратами организма, следовательно, высокая эффективность деятельности возможна и при низкой, и при высокой ее «цене». «Затратность» деятельности в большей мере определяют ценностные ориентации человека, структура установок и смыслов, преломляясь через которые, деятельность предстает как значимая либо незначимая для личности. Таким образом, оценка

и исследование профессиональной надежности невозможны без раскрытия роли субъектной активности, влияния на деятельность самой личности, ее переживаний, структуры смыслов и ценностных приоритетов, реализуемых в труде.

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ОНТО-ЭПИСТЕМОЛОГИЧЕСКОЕ ИЗМЕРЕНИЕ «КОГНИТИВНОГО ОБРАЗОВАНИЯ»

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Признание определенного качества развития когнитивного ресурса человека как предпосылки проявления и развития его инновационного потенциала определяет оформление социального запроса на междисциплинарное знание о феномене когнитивного развития человека в образовательной практике. При этом подход к обучению когнитивным навыкам в логике инструментализма способен существенно ограничить развивающий потенциал «когнитивного образования» и редуцировать «когнитивные инновации» к новым средствам педагогических манипуляций, не обеспечивающих принципиально нового качества образовательных эффектов, отвечающих ценностям компетентностного подхода. Сама возможность переноса когнитивных навыков в различные контексты образовательной и профессиональной деятельности связывается в зарубежных исследованиях с организацией определенных условий, включающих акцент на метакогнитивных и аффективных компонентах обучения, ориентацию на рефлексии стратегий обучения и саморегуляцию, опору на предшествующий когнитивный опыт студентов (P. R. J. Simons) (Billing 2007).

Интерпретация идей антропозепистемологии (S. Fuller) в контексте осмысления проблемы развития компетентности человека позволяет рассматривать образование как институт проявления «эпистемологического голоса» человека и преодоления «ассиметрии когнитивных авторитетов» (Fuller 1999). S. Paavola и K. Hakkarainen указывают на необходимость «эпистемологического сдвига» в представлениях педагогов, когнитивистов, студентов и заинтересованных сторон в создании образовательной системы, способной отвечать на социокультурные вызовы общества знания (Paavola and Hakkarainen 2005). При этом категории «знание» и «создание знания» являются ключевыми и выступают как основания для критического осмысления существующих моделей образования и построения новых, адекватных современным реалиям. Понимание образовательной деятельности как когнитивной по содержанию задает фокус осмысления феноменов становящейся образовательной реальности как пространства индивидуальных образовательных выборов студентов.

Обозначенные выше тенденции включения проблемного поля развития образования в онто-эпистемологический дискурс указывают на принципиальную значимость исследования онто-эпистемологического измерения «когнитивного образования», что и определило замысел экспериментального исследования, направленного на реконструкцию ценностно-смысловой картины образовательной

реальности как основания для проявления феноменов и противоречий развивающейся образовательной практики. Для реализации замысла исследования использованы модификации зарубежных методик, позволяющих, с одной стороны, удерживать актуальную проблематику «когнитивного образования», а с другой – содержательно описывать в адекватных конструктах представления студентов о содержании образовательной деятельности. Репрезентация эпистемологических и онтологических установок студентов проводилась с помощью модифицированного варианта методики «Шкала оценки эпистемологических и онтологических установок педагогов» (The Four-quadrant Scale: G. J. Schraw and L. J. Olafson). Целесообразность выбора «Опросника подходов и навыков обучения студентов» (ASSIST: H. Tait, V. McCune, N. J. Entwistle) определяется тем, что его концептуальными основаниями являются подходы к обучению как «воспроизведению знания» и обучению как «пониманию и развитию», подходы к научению («глубинный», «стратегический» и «поверхностно-безразличный») и предпочтения в стиле преподавания (ориентация на понимание или передачу информации). Использование «Опросника мотивированных стратегий обучения» (MSLQ: P. R. Pintrich, D. A. F. Smith, T. Garcia, W. J. McKeachie) ориентировано на исследование мотивационных установок и особенностей использования различных стратегий обучения студентами. Существенным основанием отбора данного диагностического инструмента является его теоретическая база – социально-когнитивный подход к мотивации и саморегуляции обучения.

В экспериментальном исследовании приняли участие студенты I–III курсов факультета психологии Томского государственного университета (4 специальности, всего 104 человека), студенты I–IV курсов факультета физической культуры Томского политехнического университета (89 человек) и магистры Томского государственного университета (направление подготовки – «Юриспруденция», 28 человек).

Обработка данных с помощью дисперсионного анализа (ANOVA) позволила определить достоверные различия в группах студентов с различными онто-эпистемологическими предпочтениями по шкалам опросников: взаимосвязь идей, аргументация, привязка к требованиям курса, социальное взаимодействие. При этом самоопределение студентов в направлении эпистемологического релятивизма в большей степени отвечает условиям развития когнитивного ресурса, так как в этом случае студенты ориентированы на

использование более эффективных когнитивных стратегий и социальное взаимодействие.

Обобщение результатов исследования и их осмысление в контексте когнитивной проблематики практики высшего образования позволяет сформулировать следующие выводы: выявлена тенденция смещения эпистемологических и онтологических предпочтений студентов в зависимости от курса обучения в направлении эпистемологического и онтологического релятивизма; фиксируется отсутствие достоверных различий в онто-эпистемологических предпочтениях студентов в зависимости от направленности профессионального обучения; прослеживается зависимость между выбором онто-эпистемологических предпочтений и качеством аргументации этого выбора; ценностно-смысловая «неоднородность» пространства образовательных выборов студентов определяет целесообразность рассмотрения онто-эпистемологических предпочтений студентов как параметров индивидуализации образовательного взаимодействия в его одновременной направленности как на «соответствие», так и «развитие» образовательных установок студентов; образовательные предпочтения студентов определяются их онто-эпистемологическими установками и обуславливают особенности «образовательного поведения»: направленность на развитие или «экономия» когнитивного ресурса; студенты, не разделяющие ценности развития, характеризуются зависимостью от внешних требований к содержанию образования и предметного содержания курсов, демонстрируют, с одной стороны, выраженную потребность в социальном одобрении, а с другой – низкий уровень способности к конструктивному социальному взаимодействию; существует корреляционная связь между представлениями студентов о ценностных основаниях организации образовательного процесса и уровнем сложности и эффективности используемых в качестве средств образовательной деятельности когнитивных стратегий; проявление «эпистемологических голосов» участников образовательного взаимодействия может находить адекватное отражение в идее конструирования рефлексивного знания в процессе образовательной деятельности как знаниевой основы развития компетентности.

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СТИЛИ САМОРЕГУЛЯЦИИ И САМООРГАНИЗАЦИИ ДЕЯТЕЛЬНОСТИ В УСЛОВИЯХ ОБУЧЕНИЯ НАВЫКАМ БИОУПРАВЛЕНИЯ

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Современное технологически-ориентированное общество требует все большей самостоятельности человека в отношении постановки целей, планирования и организации собственной деятельности для достижения социально и индивидуально значимых результатов. Несомненно, что в ответ на эти требования человек мобилизует имеющийся у него индивидуальный потенциал, сформированный в процессе онтогенеза под влиянием генетических и средовых факторов и имеющий сложную внутреннюю структуру. Совокупность литературных данных и собственные результаты эмпирических исследований позволяют предположить, что функционирование такой структуры, в частности, обеспечивается двумя относительно самостоятельными контурами регуляции. Один из них способствует функционированию человека как отдельного индивида и в большей степени связан с его интеллектуальной эффективностью, а другой регуляторный контур обеспечивает кооперативное функционирование человека в сообществе и в большей степени связан с его коммуникативной эффективностью и ценностно-смысловой сферой (с социальным интеллектом). Своеобразие человека в этом контексте может определяться, наряду с другими факторами, разной степенью функциональной активности этих двух контуров регуляции и, как следствие, может детерминировать существование специфических стилей саморегуляции и самоорганизации деятельности, обуславливающих результативность деятельности человека в одних ситуациях и отсутствие значимых результатов – в других ситуациях. В связи с этим, выявление этих стилей становится актуальной задачей для психологической науки. Выявлению стилевых особенностей саморегуляции и самоорганизации способствует моделирование деятельности на основе компьютерных технологий биоуправления (БОС-технологии), нацеленных на обучение и развитие у человека механизмов осознанной саморегуляции. Однако достижение человеком высоких результатов в подобных технологиях возможно только при соорганизации элементов различного уровня (физиологического, психофизиологического и личностного) в единую функциональную систему.

В соответствии с изложенными представлениями было проведено эмпирическое исследование, в ходе которого оценивались когнитивные способности (использовались «Краткий отборочный тест» В. Н. Бузина, Э. Ф. Вандерлика и методика «Скрытые фигуры» Л. Л. Терстоуна для оценки параметра «полезависимость-полнезависимость») и коммуникативность (применялись методики «Диагностика особенностей общения» В. Н. Недашковского и «Направленность личностного общения» С. Л. Братченко). Кроме того, интеллектуальная и коммуникативная активность участников исследования оценивалась с помощью «Опросника формально-динамических свойств индивидуальности» В. М. Русалова. Также был использован «Опросник самоорганизации деятельности» (Е. Ю. Мандрикова) и типологический опросник ТОП-ЮНИТ (лаборатория Гуманитарных технологий, Москва).

В исследовании была апробирована экспериментальная модель обучения навыкам биоуправления на основе психофизиологической системы «БОСЛАБ». Опыт использования модели позволяет рассматривать ее, с одной стороны, как процедуру моделирования деятельности, способствующую оценке показателей самоорганизации человека и его отношения к «новой» деятельности, а, с другой стороны, как процедуру обучения новым навыкам, на основе которой можно судить о способности человека к обучению. В апробации экспериментальной модели приняли участие 175 юношей и девушек, психофизиологические параметры которых при обучении навыкам осознанной саморегуляции непрерывно вводились в электронную базу данных. В итоге были вычислены нормативные показатели, характеризующие функциональное состояние испытуемых и его динамику.

Полученные в процессе исследования результаты свидетельствуют о том, что к окончанию процедуры обучения навыкам биоуправления можно наблюдать положительную динамику психофизиологических показателей, характеризующих эффективность механизмов саморегуляции у испытуемых. Однако был установлен факт наличия большой величины дисперсии по некоторым из регистрируемых показателей. Следовательно, можно предположить, что в изучаемой выборке имеются представители разных типов людей со специфическими механизмами саморегуляции.

Проведенный корреляционный анализ позволил выявить ряд значимых корреляций между физиологическими и психологическими показателями. Например, индекс симпато-адреналового тонуса (САТ) и индекс напряжения (ИН), отражающие особенности нервно-гуморальной регуляции, положительно коррелировали с такими психологическими показателями как «степень интровертированности», «склонность планировать свою деятельность» и «коммуникативный потенциал». Вместе с тем был установлен факт отсутствия значимых корреляций между физиологическими индексами и показателями когнитивной результативности.

Однако значимая, но слабая положительная корреляция ($r=0,234$; $p=0,020$, $n=102$) с когнитивной результативностью обнаружилась у показателя «соотношение мощности спектра низких и высоких частот» (LF/HF). Вместе с тем показатель LF/HF отрицательно коррелировал с показателем «наличие позитивных отношений с окружающими» ($r=-0,302$; $p=0,019$; $n=60$) и «коммуникативная эргичность» ($r=-0,268$; $p=0,038$; $n=60$). При этом, чем в большей степени снижалась величина LF/HF в процессе обучения навыкам биоуправления, тем сильнее была выражена способность понимать других людей в ситуации коммуникации ($r=-0,425$; $p=0,002$; $n=49$) и выше коммуникативный потенциал ($r=-0,352$; $p=0,013$; $n=49$). Наряду с этим, мощность спектра низких частот (LF) в сильной степени коррелировала с показателем диалоговой направленности в общении ($r=0,552$; $p=0,000$; $n=45$). Однако, чем в большей степени показатель LF снижался в

процессе обучения навыкам биоуправления, тем менее человек оказывался склонен использовать диалог в процессе общения ($r=-0,407$; $p=0,006$; $n=49$).

Как можно заметить, в процессе обучения навыкам биоуправления физиологические показатели в различной мере связаны с когнитивными и коммуникативными показателями. Приведенные примеры корреляций (а также другие эмпирические данные) убеждают в том, что мы располагаем материалом, позволяющим продемонстрировать наличие специфических стилей саморегуляции и самоорганизации деятельности. Эта убежденность усиливается результатами кластерного анализа, указывающего на существование 4 групп испытуемых. Следует учитывать, что каждый из существующих стилей подчиняется не общим, а специфическим закономерностям, знание о которых может способствовать эффективному решению практических задач. Стилиевые закономерности могут быть учтены для повышения эффективности БОС-тренингов, использующихся в сфере медицины, образования и профессиональной подготовки (например, при подготовке лиц экстремальных профессий и спортсменов высокой квалификации).

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ВЛИЯНИЕ ГИПОКСИЧЕСКОГО ВОЗДЕЙСТВИЯ НА СЛУХОРЕЧЕВУЮ ФУНКЦИЮ

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Изучение влияния гипоксии на базовые системы организма человека является одним из ведущих направлений современных исследований в области физиологии и медицины. Согласно большинству клинических наблюдений и экспериментальных данных, высокой чувствительностью к недостатку кислорода обладают нервно-психические функции и сфера

высшей нервной деятельности, что проявляется в расстройстве сложных аналитико-синтетических механизмов взаимодействия сенсорных и когнитивных процессов (мышление, память, внимание). Основной цикл исследовательских работ в этой области посвящен изучению влияния гипоксии на деятельность зрительного анализатора и обработку визуальной информации. В данной работе представлены результаты начального этапа исследования влияния гипоксического воздействия на слуховую систему и ряд когнитивных функций, связанных со слухом и речью.

Исследование проведено на группе испытуемых, в общий состав которой вошли 25 курсантов Военно-медицинской академии им.

С. М. Кирова: 20 юношей и 5 девушек в возрасте 18–22 года с нормальным психосоматическим статусом. Моделирование эффекта гипоксии осуществлялось при помощи гипоксикатора модели «Эверест» и дыхания через маску газовой смесью с пониженным содержанием кислорода (10.6–11.2) в течение 15 минут. Во время сеанса контролировалось содержание кислорода в крови (график сатурации) и частота пульса испытуемого. В серии экспериментов по исследованию разового воздействия гипоксии (РГ) измерения проводились в двух условиях: до РГ и через 5 минут после снятия маски. При изучении влияния интервальных гипоксических тренировок (ИГТ) измерения проводились до начала тренинга и спустя 2 месяца, в течение которых испытуемые получали 20 сеансов гипоксического воздействия. Оценка влияния гипоксии производилась на основе тестирования базовых слуховых навыков: обнаружение паузы в сигналах разной длительности и спектрального состава, различение ритмических последовательностей, выделение целевого слова из суммы одновременно произнесенных слов («речевой коктейль»). Кроме того, оценивалось воздействие гипоксии на когнитивные показатели: произвольная вербальная память, объем кратковременной слуховой памяти, устойчивость внимания. Для психофизического тестирования слуховой функции были использованы инструментальные методики на базе компьютерной системы «Учись слушать», разработанной специалистами Института физиологии им. И. П. Павлова РАН и Санкт-Петербургского НИИ уха, горла, носа и речи МЗСР РФ. Психологическое тестирование осуществлялось на основе тестов Лурия, Джекобса и Бурдона. Слуховые тесты проводились в режиме РГ, тесты Лурия и Бурдона – в режиме ИГТ, Джекобса – РГ и ИГТ.

Результаты тестирования слуховых навыков позволили выявить различия в индивидуальных реакциях испытуемых на гипоксическое воздействие. В соответствии с характером изменения показателей они были объединены в группы: улучшение данных после гипоксического воздействия (1), отсутствие изменений (2), ухудшение результатов (3). По данным тестирования на обнаружение паузы относительное число испытуемых в 1-й и 2-й группах составило от 62% до 95% (тесты с сигналами разного спектрального состава). При этом среднее число правильных ответов по всем испытуемым и всему набору стимулов увеличилось на 15%, а время реакции уменьшалось на 7%. При выделении целевого слова в «речевом коктейле» эти показатели составили – 83%

(1–2 группы), 10% и 25%, соответственно. При восприятии ритма – 93%, 12% и 15%. Положительное воздействие гипоксии наиболее проявилось при восприятии ритма и обнаружении паузы в относительно высокочастотных тональных сигналах (1000 и 2000 Гц), наименее – при обнаружении паузы в шумовом и низкочастотном тональном сигнале (500 Гц). Увеличение скорости ответа после гипоксии зафиксировано при выполнении всех тестов этой серии. Кроме того, для 12 испытуемых, прошедших тестирование по всему набору из 10 слуховых тестов, была определена основная тенденция в изменении показателей под влиянием гипоксического воздействия – условно, «лучше и равно» или «хуже» (рис. 1).

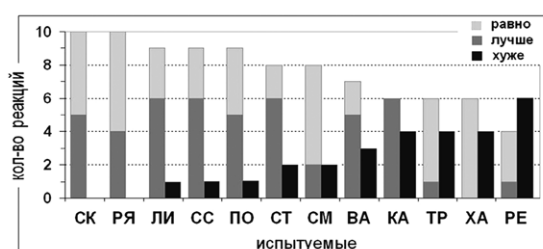


Рис. 1. Индивидуальные различия в реакции на гипоксическое воздействие (данные 10 слуховых тестов)

Представленные гистограммы отражают индивидуальные различия в реакциях на гипоксическое воздействие и показывают, что психофизическое тестирование слуховых навыков может быть использовано для оценки степени устойчивости испытуемых к фактору гипоксии.

По результатам психологического тестирования было показано, что в наибольшей степени влиянию гипоксии подвержены характеристики кратковременной слуховой памяти. Это влияние при всех режимах воздействия носило положительный характер и проводило к увеличению продуктивности запоминания (в среднем на 17%) и объема памяти: с 6.5 до 7.2 условных единиц (при РГ) и с 7.1 до 7.8 (при ИГТ) у 18 испытуемых из 19 участников этих тестов (рис. 2).

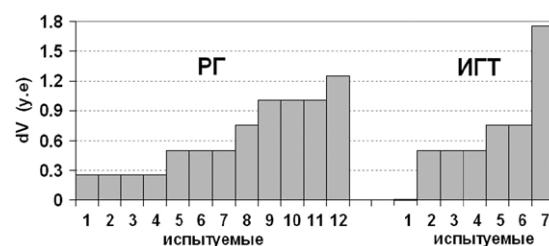


Рис. 2. Индивидуальные показатели изменения объема кратковременной слуховой памяти (dV) после гипоксического воздействия

По результатам теста Лурия заметных изменений под воздействием ИГТ выявлено не было: и до, и после гипоксии полный список слов 55% испытуемых воспроизводили после 3-х попыток. При выполнении теста Бурдона скорость просмотра строк до и после ИГТ также сохранялась

на одном уровне (в среднем 0,4 строки за 1 с). Однако тенденция к улучшению проявилась в показателях концентрации внимания: снизилось число ошибок по группе (в среднем, на 23%), увеличилось число испытуемых, выполнивших тест без ошибок (на 25%).

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Подобно тому, как в психометрической парадигме процедура измерения определяет понятие, так в психодиагностике материалу теста соответствует вид мышления. Вместе с тем, не учитывается, что виды мышления – наглядно-действенный, наглядно-образный, понятийный – это этапы становления мышления в онтогенезе, а не самостоятельные виды мышления. В то же время сам по себе значимый факт функциональной асимметрии полушарий мозга оказывает в настоящее время плохую службу в качестве научного плацдарма и объяснительного принципа наличия образников-художников и вербалистов-ученых. Такой подход ведет к застою в исследовании важнейшей психической функции Homo-sapiens.

Полувековое исследование мышления как процесса в рамках школы Рубинштейна позволяет утверждать, что процесс мышления действует **все** языки (вербальный, образный), а их динамика связана непосредственно с местом и ролью конкретного этапа в решении задачи. Оно начинается с неоднократного проговаривания условий задачи. Сразу после вербализации (речи вслух) наблюдается перевод условий на предметный (субъективный) код, который обеспечивает возможность трансформации, дополнения и преломления информации, поступающей в виде задачи, в соответствии с информацией, хранящейся в памяти, что и обуславливает индивидуализированные формы понимания одной и той же ситуации. С помощью этого кода на первом этапе анализа условий идет как бы восстановление предмета, реального содержания задачи. Это субъективное видение условий проблемной ситуации следует классифицировать как «образ проблемной ситуации». Собственно условия задачи вычленяются в процессе соотнесения всего образного видения ситуации с требованием задачи. Требование определяет тот аспект, по которому в исходном

материале вычленяются релевантные стороны объектов. Благодаря этому условия становятся однородными и, как следствие, сопоставимыми, что позволяет перейти к знаковому представлению собственно условий задачи. Однородность условий позволяет выстроить систему их отношений, а знаковая реализация – построить схему этих отношений. Конечно, мы учитываем, что речедвигательный анализатор обязательно включается в процесс построения этой системы: на уровне внутренней речи постоянно и речи вслух, когда у испытуемого нет других условий объективации.

Построенная схема системы отношений исходной задачи отражает видение задачи уже на другом уровне. Это абстракция сущности задачи на новом витке ее отражения по сравнению с первоначальным образом проблемной ситуации. Здесь мы имеем дело со структурой, не только отображающей, но и **порождающей**: являясь результатом анализа отношений в данной проблемной ситуации, она выступает как ее субъективная мысленная модель, с которой как бы «считывается» тот или иной принцип решения (идея, гипотеза, концепция). В конечном счете, модель строится как замыкание гештальта, с чем и связано понимание ситуации. Это действительно «видящая мысль» (Гете). Предельно тонко фиксирует это состояние Г. Хант как «ощущаемый смысл» (1998: 235). В ряде экспериментальных исследований нами показано, что построение модели проблемной ситуации, далее концептуальной модели (К-модели), описывает полный цикл презентации конкретной ситуации, который включает с необходимостью весь набор языков и не ограничен каким-либо одним приоритетным: вербальным или визуальным (2009: 43–90).

В том случае, если слово отрывается от стоящей за ним визуальной структуры, то, по мнению и Л. М. Веккера, это ведет к непониманию. «Непонятая мысль... перестает быть мыслью в ее специфическом качестве и может быть только механически воспроизведенной... пустотелой речевой оболочкой, «речевым трупом» (Веккер

Л.М., 1998: 276). Это единство языков в процессе мышления отмечает и С.Л. Рубинштейн: «Наглядные чувственные элементы образуют не только отправной пункт мышления, от которого мышление исходит, чтобы затем его покинуть, от него освободиться. В реальном мыслительном процессе понятия не выступают в отрешенном, изолированном виде; они всегда функционируют в единстве и взаимопроникновении с наглядными моментами представлений и со словом, которое, будучи формой существования понятия, всегда является вместе с тем неким слуховым или зрительным образом» (Рубинштейн, 1959: 61).

Для понимания природы перекодирования – «взаимодействия языков», языков «внутри индивида», Веккер использует в качестве аналогии, которая не хромает, а действительно схватывает явление, перевод с иностранного языка. Мышление как процесс представляет собой, по его мнению, «непрерывный обратимый перевод информации с языка предметных гештальтов, представленных образами разных уровней обобщенности, на... язык, представленный... структурами речевых сигналов» (1998: 274–275).

Нами подчеркивается, что характер языка определяется содержанием этапа, он носит строго определенное функциональное значение. Подчеркивая визуальный характер К-модели, мы сталкиваемся с проблемой модальности ее реализации. С одной стороны, можно предположить, что К-модель реализуется в языке ведущего анализатора данного человека. С другой, – данные многих исследований говорят в пользу универсальности пространственного кода. В этом плане интересно диссертационное исследование О. Таллиной по музыкальным способностям, в котором убедительно показано, как музыканты перекодируют мелодию в пространственные схемы. Моцарт утверждал, что может увидеть все произведение единым взором в уме, как будто это прекрасная картина.

Недаром Вл. Короленко в своей знаменитой повести «Слепой музыкант» описывает освоение мира слепым ребенком путем перевода звуков в невидимое, но слышимое им пространство. По мнению Р. Арнхейма, зрение – единственная сенсорная модальность, в которой могут быть с достаточной сложностью представлены все пространственные отношения, в то время как диапазон тактильных и мускульных ощущений ограничен и носит симультанный характер (1994: 162). В этом плане очень значима мысль Веккера о том, что «устранение лимитов диапазонов разных модальностей означает не освобождение вообще от модальных, или качественных, характеристик мыслительного процесса, а освобождение от тех субъективных ограничений, которые накладывают на эти характеристики специфика самого носителя информации. Это устранение субъективных ограничений... не ликвидирует, а объективирует модальные характеристики, что выражается в их переводе в более общую систему отсчета и на более универсальный физический язык» (Веккер Л.М., 1998: 101). Г. Хант объясняет данную возможность как реализацию «межмодальной трансляции», которую обеспечивает новая кора у человека (2002: 233).

Представленный подход позволил нам проследить формирование того, что угадывалось Рубинштейном еще в 1946 г., когда он писал об «особых схемах, которые как бы предвосхищают словесно еще не развернутую систему мыслей» (1946: 348).

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МОЗГОВОЕ ОБЕСПЕЧЕНИЕ ЭМОЦИОНАЛЬНЫХ СОСТОЯНИЙ РАЗНОГО ЗНАКА, ВЫЗВАННЫХ ТВОРЧЕСКИМ ВООБРАЖЕНИЕМ ИЛИ АВТОБИОГРАФИЧЕСКИМИ ВОСПОМИНАНИЯМИ, ПО ДАННЫМ СПЕКТРАЛЬНОЙ МОЩНОСТИ ЭЭГ

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Мозговое обеспечение эмоций зависит не только от валентности эмоций, но и от таких факторов, как активационный компонент эмоций (Russell 1980, Aftanas et al. 2004, Yoon-Ki Min et al. 2005), способ индукции эмоций – внешняя или внутренняя (Данько и др. 2011).

В наших предыдущих исследованиях, во время внутренней индукции эмоциональных состояний у студентов-актеров (переживания сценических этюдов или автобиографических ситуаций), были выявлены различия в параметрах ЭЭГ в зависимости от того, личными или сценическими переживаниями вызывались эмоции (для обзора см. Данько 2008, Данько и др. 2011). Было сделано предположение, что полученные различия могут быть связаны с разной интенсивностью переживаемых личных или сценических эмоций (активационный компонент) или с разным вкладом в реализуемую деятельность сопутствующих когнитивных процессов: автобиографическая память (при личных эмоциях) и творческое воображение (при сценических эмоциях). Однако в известной нам литературе не удалось найти сравнения параметров осцилляторной ЭЭГ при сопоставлении таких сложных видов когнитивной деятельности, как эпизодическая память и творческое воображение. Настоящее исследование имело целью получение такого рода данных.

В исследовании приняли участие 49 студентов-актёров (29 мужчин, 20 женщин). Испытуемые с открытыми глазами (взгляд фиксирован на точке) выполняли задания из актерского тренинга: 1) реальная прогулка (Р) – (доминирование эпизодической памяти) – задание мысленно пройти по хорошо известной дороге; 2) фантастическая прогулка (Ф) – (доминирование творческого воображения) – задание мысленно пройти по выдуманной, фантастической дороге. Каждое из заданий состояло из трех этапов: нейтральная прогулка (Р или Ф); эмоционально положительная прогулка (РП или ФП); эмоционально негативная прогулка (РН или ФН). Состояние покоя с открытыми глазами использовалось в качестве референтного. Испытуемые оценивали по шкале от +3 до –3 выраженность эмоций во время выполнения заданий.

Регистрация ЭЭГ проводилась от 19 электродов (система 10–20) с объединенным референтным электродом на мочках ушей, монополярно. Вычислялись оценки абсолютной мощности ЭЭГ в 7 частотных диапазонах: от дельта (1,5–3 Гц) до гамма (30–40 Гц). Для статистического анализа использовался дисперсионный анализ (ANOVA). При определении достоверности влияния взаимодействий основных факторов (main effects) учитывалась поправка Гринхауза-Гайзера. Топография значимых различий выявлялась посредством множественных сравнений (post hoc comparisons) с использованием LSD критерия Фишера. Нуль-гипотеза – отсутствие

достоверных различий между средними – отклонялась при вероятности ошибки $< 0,05$.

В результате исследования выявлено, что при сравнении заданий РН и РП с заданием Р, задания с разной эмоциональной валентностью характеризуются разнонаправленными изменениями мощности в высокочастотных диапазонах ЭЭГ – в задании РН мощность в бета и гамма диапазонах преимущественно уменьшается, в задании РП – преимущественно увеличивается, а уменьшения мощности отмечаются только в лобных отведениях. При сравнении заданий ФН и ФП с заданием Ф таких четких разнонаправленных изменений не выявлено. Возможно, это может объясняться разной выраженностью возникающих во время выполнения заданий эмоций. Так, согласно субъективной оценке испытуемых, задания РП и РН характеризуются большим диапазоном эмоциональных переживаний (от +2,56 баллов для задания РП до –1,8 баллов для задания РН), чем задания ФП и ФН (+2 и –1 баллов соответственно).

При сравнении эмоционально нейтральных заданий Р и Ф с состоянием ГО показано, что эти разные когнитивные задания характеризуются сходными изменениями в картине ЭЭГ, которые затрагивают все частотные диапазоны. Различия между заданиями Р и Ф в сравнениях Р-ГО и Ф-ГО отражаются только в степени выраженности изменений мощности ЭЭГ в высокочастотных диапазонах – во время задания Ф изменения мощности в бета и гамма диапазонах более выражены. При непосредственном сравнении заданий Ф и Р между собой показано, что задание Ф относительно Р отличается уменьшением мощности в бета и гамма диапазонах в лобных отделах на фоне преимущественного увеличения мощности в остальных отделах коры. Тот факт, что при сравнении двух когнитивно разных предположительно эмоционально нейтральных заданий получены такие же изменения в картине ЭЭГ, как и при сравнении заданий с исходно разной эмоциональной валентностью, позволяет предположить, что различия между заданиями Р и Ф все же больше связаны с разной эмоциональной окраской этих заданий. Согласно самоотчетам испытуемых, эти задания действительно характеризовались разными ($p \leq 0,0094$) эмоциональными оценками, задание Ф оценивалось как более положительное относительно Р.

Полученные данные подтверждают результаты предыдущих исследований (Данько 2008, Данько и др. 2011) о том, что при внутренней индукции эмоциональных состояний валентность эмоций отражается преимущественно в

разнонаправленных изменениях мощности в бета и гамма диапазонах ЭЭГ. Изменения мощности в остальных частотных диапазонах ЭЭГ, вероятно, в большей степени являются отражением сопутствующих эмоциям когнитивных процессов. Тот факт, что при сравнении реальной и фантастической прогулки с состоянием ГО выявлены сходные изменения мощности ЭЭГ, позволяет предположить существование общих системных механизмов у процесса воображения и процесса воспоминаний. Возможно, процесс извлечения информации из эпизодической памяти можно рассматривать как вид воображения – репродуктивное воображение, в противовес продуктивному, творческому воображению (Немов 2003). Также возможно, что различия между сравниваемыми когнитивными процессами выражаются в тех нейрофизиологических механизмах, которые сложно выявить при анализе осцилляторной ЭЭГ.

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РЕКЛАМНЫЙ ПЕРСОНАЖ КАК ФАКТОР ОЦЕНКИ РЕКЛАМИРУЕМОГО ПРОДУКТА В РАЗЛИЧНЫХ УСЛОВИЯХ ПРЕДЪЯВЛЕНИЯ

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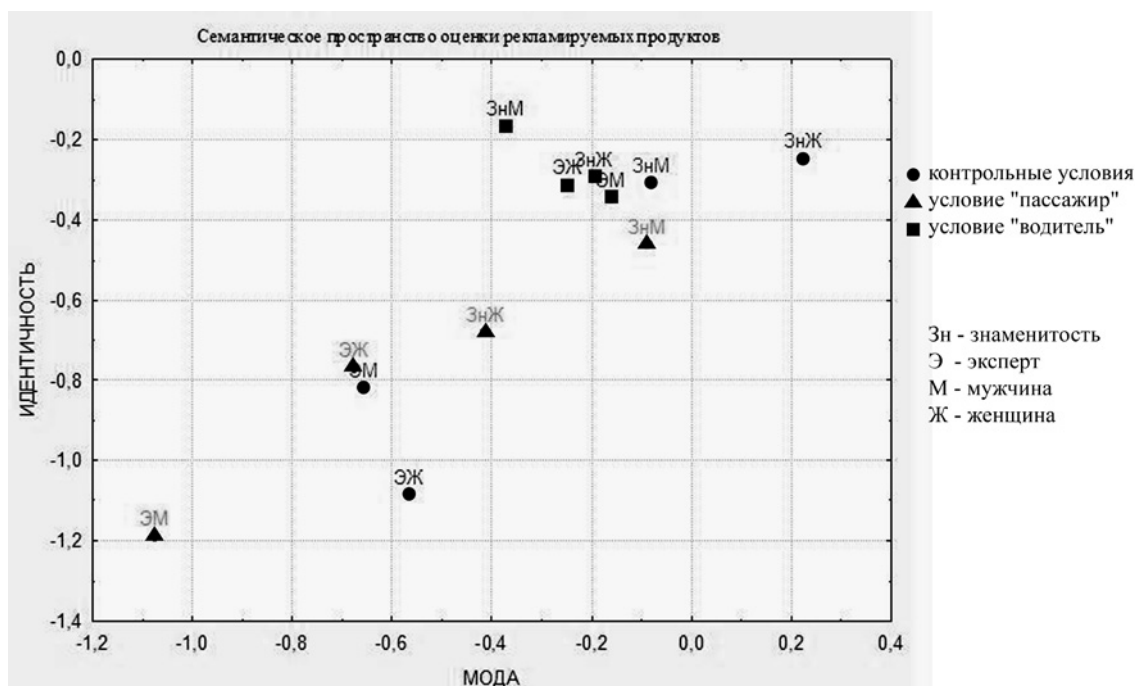
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Категории восприятия и внимания используются в исследованиях, посвященных решению маркетинговых проблем, рекламы и разработки рекламных коммуникаций. В маркетинг понятие когнитивных процессов проникло из современной психологии, в которой когнитивная психология всю вторую половину 20-го века и до сего дня является ведущим направлением психологической науки.

В рекламе существует много способов привлечения внимания к рекламируемым товарам: категории размера, размещения, цвета, присутствие различных объектов рядом с товаром, обращающих внимание на себя, а соответственно и на продукт. Часто для улучшения рекламной коммуникации используются рекламные персонажи (РП) – выдуманные и мультипликационные персонажи, эксперты, знаменитости и др. (Ткаченко, 2007). При использовании РП важно учитывать специфику их видов – где-то целесообразно использовать РП-эксперта, где-то РП-знаменитость – дабы привлечь внимание даже не нуждающегося в рекламируемом товаре человека.

Одним из частых условий предъявления рекламы является транзитная реклама. В этом случае закономерности отбора информации и, как следствие, возможность считывания информации о РП определяются закономерностями функционирования селективного внимания. Восприятие транзитной рекламы возможно при двух условиях: «водитель» и «пассажир», отличающиеся друг от друга наличием сложной перцептивной задачи и признаков релевантности информации в первом условии. На наш взгляд, моделью, которая будет описывать эффективность РП в указанных условиях восприятия рекламы, будет модель N. Lavie (Nilli Lavie, 2006), в которой говорится о возможности переработки любой информации в условиях достаточного ресурса и строгом отсеке иррелевантной информации в случае ресурсного дефицита. На основании данной модели можно предположить, что использование РП в транзитной рекламе, целевой аудиторией которой являются пассажиры, сравнительно эффективно, в то время как эффект воздействия РП на водителя будет стремиться к нулю.

Гипотеза исследования: дифференциация оценок рекламируемого продукта различными типами РП при предъявлении макетов в условиях, моделирующих реальную ситуацию автотрассы, будет нивелироваться по сравнению с



контрольным замером в условиях предъявления без помех на неограниченное время.

Структура исследования: 2 группы независимых переменных: 1. Идентификационная привлекательность РП: X1 – РП-эксперты (низкая идентификационная привлекательность), X2 – РП-знаменитости (высокая идентификационная привлекательность). 2. Условие предъявления рекламного плаката: Y1 – предъявление в обычных условиях (контрольные условия), Y2 – предъявление, моделирующее условия абсорбции (условие «пассажир»), Y3 – предъявление, моделирующее условия активного, концентрированного внимания на другой задаче (условие «водитель»). Зависимая переменная – оценка продукта, рекламируемого РП с различной идентификационной привлекательностью по шкалам частного СД.

В исследовании участвовало 229 человек возрастной категории 19–21 год. Для проведения исследования было создано 4 рекламных плаката, рекламирующих одну и ту же жевательную резинку, которую мы назвали «freedom», причем в двух из них рекламным персонажем выступают знаменитости (Джим Кэрри, Леди Га-Га), а в других двух – эксперты, которыми являются врачи-стоматологи (мужчина и женщина). Персонажи-знаменитости были выбраны именно эти, т.к. занимают достаточно высокие места по рейтингу известности и обладают белоснежной улыбкой, что важно в рекламе жевательной резинки. Использован метод семантического дифференциала. Шкалы были выведены

в результате анализа рекламных текстов путем выявления типичных потребительских свойств жевательной резинки, частично из семантического дифференциала Петренко В. Ф. (Петренко, 1997). Шкалы были выделены по трем основаниям: эмоциональная оценка, потребительские качества, идентификация.

Организация исследования – интергрупповой план ввиду необходимости однократного предъявления стимула (выборка разбита на 12 групп, каждой из которых предъявлялось по 1 плакату с различными типами РП в трех условиях: 4 группам – в условии Y1 (предъявлялся плакат, задание – оценить жвачку по шкалам СД), 4 группам – в условии Y2 (просили просмотреть презентацию, затем давали задание оценить жвачку по шкалам СД) и 4 группам – в условии Y3 (просили при просмотре презентации считать количество кружков на слайдах, затем давали задание оценить жвачку по шкалам СД).

Результаты: факторным анализом было выведено несколько критериев (факторов) оценки товара. Наиболее интерпретированной оказалась четырехфакторная модель, в которую вошли такие факторы, как мода; идентичность; эффектность; полезность, дороговизна. Значимые различия между оценкой товаров, рекламируемых разными типами РП, по факторам (U-критерий Манна-Уитни) в группах чистого предъявления получились по трем факторам, в группах при условии «пассажир» – по одному, а в группах при условии «водитель» не было

выявлено ни одного значимого различия. Из семантического пространства по более весомым факторам видно, что влияние специфики РП (эксперт или знаменитость) на оценку продукта действительно нивелируется в условиях, моделирующих активное внимание.

Эффективность использования РП в условиях «пассажир» и «водитель» снижается, особенно

во втором случае, как нами и предполагалось в гипотезе.

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СОПОСТАВЛЕНИЕ КЛЮЧЕВЫХ ФРАГМЕНТОВ ДЛЯ ПОНИМАНИЯ ИЗОБРАЖЕНИЯ И ДЛЯ ЕГО РАСПОЗНАВАНИЯ

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Предлагаемый подход нацелен на выявление и сопоставление ключевых фрагментов зрительного поиска для понимания незнакомого и распознавания знакомого изображения. После вывода на экран монитора размытого изображения тестируемому лицу предоставлялась возможность, нажимая на кнопку мыши, осуществлять кратковременное восстановление четкости любого из локусов. Размер локуса соответствовал проекции фовеа ($1,3^\circ$) в поле зрения; время его предъявления было ограничено сверху 450 мс. При досрочном щелчке мыши происходил возврат четкого фрагмента (окна) в размытое состояние и вывод следующего окна, центр которого определялся положением курсора. Допускалось повторное обращение к участку, заинтересовавшему наблюдателя. Каждое окно, появлявшееся всегда как единственный четкий участок на размытом изображении, становилось центром притяжения и фиксации взгляда. Корректные размер и лимит времени предъявления окон предопределяли точность пространственного отслеживания фиксации на четких фрагментах изображения, делая ее сопоставимой с таковой при использовании современных систем регистрации движений глаз. Участникам экспериментов предлагалось, выбирая позицию и открывая последовательно один локус за другим, с *минимальным* количеством шагов опознать изображение, а если оно незнакомо, понять и описать основное его содержание. Временная последовательность и положение окон регистрировались. В каждом случае производилась идентификация области частичного осмотра изображения, достаточной для решения поставленной задачи.

На иллюстрации представлены результаты, полученные при тестировании 42 добровольцев (студентов и сотрудников ЮФУ, средний возраст 24 ± 1 год), которым предъявлялось размытое изображение репродукции картины И. Е. Репина «Не ждали». В секторе А. представлен комплекс перекрытия *всех* областей частичного осмотра репродукции в группе лиц, не знакомых с изображением. Этот комплекс является, по сути, *концентрированным выражением сюжета* картины, включающим узловые элементы контекста: и лица основных персонажей, обращенные к тому, кого «не ждали», и фрагмент верхней одежды вошедшего, и даже руку горничной, еще не отпустившей дверь. Некоторые из этих элементов, существенные для верной интерпретации изображения, но второстепенные в сюжете, могут вообще не выходить на вербальный уровень при описании сцены. Незнакомая сцена требует выявления логических связей (между ее частями) для формирования целостного представления в сознании и соответствующих энграмм в памяти. Поэтому области осмотра изображения в рассматриваемой группе содержат большое количество окон (в среднем, 225 ± 28) и много возвратных переходов. Если бы участники экспериментов сканировали изображение, многие из них могли бы обойти его несколько раз, но их внимание было привлечено, несмотря на индивидуальные различия осмотров, к комплексу *ключевых*, наиболее информативных для *понимания* изображения фрагментов.

Из пяти условно выделенных фрагментов этого комплекса (обозначенных на иллюстрации цифрами 1–5) лишь один оказался необходимым *всем* участникам экспериментов, *распознавшим* сцену. В секторе Б. I представлен *ключевой для распознавания* фрагмент изображения, отмечавшийся как таковой тестируемыми лицами в отчетах. Часто после его обнаружения участники экспериментов узнавали картину. Два человека распознали сцену, открыв всего по 2 окна в зоне

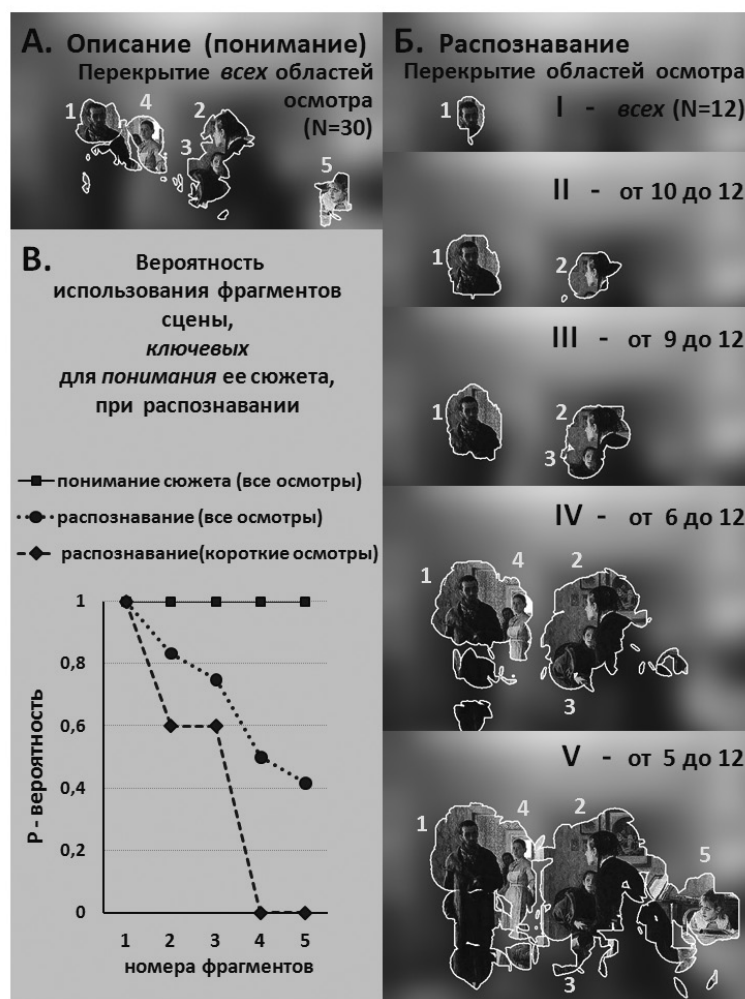


Иллюстрация. Сравнение комплексов перекрытия для областей частичного осмотра картины И. Е. Репина «Не ждали» в двух группах лиц: А – не знакомых с произведением, понявших его сюжет и описавших сцену; Б – распознавших изображение. Б. II–V – визуализация диапазонов перекрытия, нижние границы которых расширились до появления очередного из фрагментов 2–5. В – сопоставление приоритета фрагментов для решения задач понимания и распознавания.

этого фрагмента. Перекрытия, представленные в секторах Б. II – V, демонстрируют снижение приоритета фрагментов с номерами 2–5 при распознавании, по сравнению с их значимостью для понимания изображения (сектор А).

Возможность воссоздать знакомую сцену на основе уже сохраненных в памяти связей между ее частями приводит к *редукции ключевого*

комплекса, иллюстрируемой графиком (в секторе В). Как свидетельствует график, эта редукция наиболее выражена в самых коротких осмотрах. Обсуждаются варианты возможной связи выраженной редукции ключевого комплекса с симультанным распознаванием, реализующим автоматическое извлечение целостных образов из памяти.

ОПЫТ ПОЗНАНИЯ СКРЫТОЙ КАТЕГОРИАЛЬНОСТИ ЯЗЫКА

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Наше исследование скрытой категориальности и внутренней формальности языка находится на пересечении интересов корпусных и когнитивных исследований, лексической и грамматической семантики, синтаксиса и

типологии. Для решения прикладных задач, например, машинной обработки естественного языка (NLP), создания самообучающихся алгоритмов аннотирования естественного языка (annotation algorithms) и т. п., создаются проекты (Framenet, Penn Treebank и др.), направленные на семантическое описание языка. Мы предприняли попытку *палеосемантического* исследования абстрактных имен на материале корпусного анализа скрытых классов (*криптоклассов*)

английского языка. Методология и результаты такого исследования могут найти применение при решении прикладных задач.

Отправной точкой исследования явилась назревшая необходимость включения скрытых категорий в лингвистическое описание наряду с явными, выраженными грамматически, о чем в свое время писали Э. Сепир, Б. Уорф, А. К. Жолковский, С. Д. Кацнельсон, Ю. Д. Апресян, Ю. С. Степанов, В. А. Плунгян и др. Осознание важности изучения скрытой категориальности языка позволило В. А. Виноградову (Виноградов 1990) предложить *типы классификативности* малых степеней грамматикализованности, которые «вписались» в шкалу именной классификативности, сформировав ее левый край – зону скрытой категориальности языка. За основание типологизации именных классификативных систем была принята грамматикализованность. Шкала *классификативности* по В. А. Виноградову выглядит следующим образом: (I) эпидигматика → (II) эхосемия → (III) эхоморфия → (IV) нумеративы → (V) именные классы → (VI) род (Виноградов 1990: 205). Эти типы, с одной стороны, характеризуют именные классификации в современных языках, с другой стороны, они соответствуют стадиям развития языка. Накопленное языком знание о мире на ранних стадиях становления языка и мышления (I–III) представляет интерес для науки, поскольку там можно найти ответы на многие вопросы, связанные с функционированием языка.

В тех современных языках, где именная классификативность до сих пор проявляется только в менее грамматикализованных (I–III) формах (в частности, в английском), можно выделить и описать скрытые лексические классы существительных, называемые в работе *криптоклассами*. *Криптокласс* определяется как лексико-грамматическая категория существительного, состоящая в распределении имен по классам в соответствии с семантическими признаками при обязательной выраженности классной принадлежности имени в структуре предложения через классификатор (конструкцию) и имеющая соответствие в явной грамматической категории хотя бы одного языка мира. *Криптокласс* связан со скрытыми типами классификативности. Возможность рассмотрения криптокласса в двух аспектах: как разновидность *эпидигматики* (I), истоки которой коренятся в *эхосемии* (II), находит отражение в структуре криптокласса: в криптоклассе «соседствуют» *имена-эталоны* и *метафоронимы* – имена, для которых характерен эффект

семантического резонанса классом признаковых слов и категориальных признаков, не присущих самой природе абстрактной сущности, а приписанных ей сознанием вместе с признаковым словом и отраженных в плане содержания абстрактных имен. Например, криптокласс английского языка «Жидкие» включает *имена-эталоны* (*water, blood, milk*) и *метафоронимы* (*information, comfort, love, stress, success* и др.). Семантическая неоднородность криптокласса «компенсируется» однотипностью его когнитивных и психолингвистических основ – тех параметров первичной категоризации явлений физического и психического миров (т. е. номинационной стихии языка), которые связаны с характеристиками архаичного, мифологического, дологического мышления. Анализ показал, что криптокласс более последовательно отражает когнитивную «наивную» категоризацию мира, чем более грамматикализованные формы проявления категориальности, к примеру, именные классы в африканских языках.

Опыт познания скрытой категориальности языка позволил нам прийти к выводу о ее двусторонней сущности. С одной стороны, *именной криптокласс* представляет собой производное «наивной» категоризации мира, хранящееся в семантико-синтаксической валентности имен. С другой стороны, криптокласс систематизирует *метафорические образы* современного состояния языка. Проведенное исследование представляет собой попытку систематизации обычно разрозненных сведений о метафорах абстрактных имен в английском языке.

Методика криптоклассного моделирования реализует синтез качественного и количественного подходов к корпусному анализу, что позволяет получить максимально полное и максимально объективное знание о предмете описания. В результате анализа были выявлены шесть *именных криптоклассов* английского языка, в основании которых лежат базовые категориальные семантические признаки, связанные с топологией мира: четыре – с формой, один – с размером и один – с консистенцией. Анализ показал, что на фоне шести рассмотренных признаков выделяется один – «рукоятность» (соизмеримый с ладонью размер предмета, позволяющий манипулировать им), который был обнаружен в семантике 96,5% имен и который является самым частотным по количеству корпусных вхождений (71% от общего корпуса сл/употрбл.).

Выявление скрытой классификации имен в рамках одного языка методом криптоклассного анализа дает возможность свести

лексико-семантическое разнообразие сочетаемости слова к определенному (хотя и неполному) набору *признаков*, выступающих в виде общего основания для изучения языковой изменчивости (language variation). К примеру, для имени *hope* первым по «прочности воспоминаний» является признак «нитевидность», в то время как сочетаемость имени в современном английском языке регулируется в большей степени признаком «рукотатность».

Криптокласс как разновидность скрытой категоричности языка является аккумулятором и носителем «скрытой памяти» слова. До тех пор, пока в имени можно обнаружить классему, являющуюся «следом» приписываемого имени признака, его сочетаемость будет регулироваться законом «криптоклассного распределения». Суть закона сводится к следующему: сочетаемость имени зависит от того, какие криптоклассы присущи имени. Действительно, в семантике

имени аккумулируются признаки, которые ассоциировались с именем в течение его жизненного цикла. Методом криптоклассного анализа можно установить, какие признаки до сих пор ассоциируются с именем, ранжировать («взвесить») их и выяснить, какие получают большую, а какие меньшую функциональную нагрузку в современном языке. Таким образом, и сочетательная динамика имени, и реализация сочетательного потенциала имени во многом определяются законом «криптоклассного распределения».

В докладе будут рассмотрены результаты криптоклассной распределенности 500 имен английского языка, будет предложена количественная оценка «прочности» связей абстрактных имен с признаками, которые приписывались именам на протяжении их жизненного цикла.

Виноградов В. А. 1990. Вариативность именных классификаций // Языки мира: Проблемы языковой вариативности. М. 171–209.

МНОГОФАКТОРНЫЙ ВЫБОР В ЛИНГВИСТИЧЕСКОМ МОДЕЛИРОВАНИИ

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Рассматривается модель речевой деятельности, отражающая выбор единиц при речепорождении с учетом нескольких факторов. Показана возможность лингвистической интерпретации понятий «активизированности в памяти», «выводов слушателя», «ассоциаций рецепиента» и ряда других.

Моделирование речепорождения и речевосприятия в лингвистике ориентируется не на адекватность описания психологическим процессам, а на внутреннюю (в рамках языковедения) непротиворечивость и предсказательность относительно порождаемых текстов. Поскольку лингвисту приходится иметь дело с дискретными структурами, модели обычно ориентированы на алгоритмы однозначного выбора, например, значение 'X' выражается единицей X в контексте A, единицей Y в контексте B и т. д.

Однако в лингвистике накоплено немало проблем, которые решаются другим способом: выбирается X, если факторов в пользу его выбора больше, чем в пользу выбора других единиц. (Борисова 1996) Иными словами, вводятся понятия а) учета различных факторов (вместо одного), б) «взвешивания» факторов. Необходимость учета различных факторов

при выборе референта личных и указательных местоимений продемонстрирована в работах А. А. Кибрика (см. Кибрик и др. 2010).

Предлагается учитывать различные факторы, влияющие на выбор конкурирующих единиц (синонимов или слов одного функционально-семантического поля, грамем, не находящихся поддержки в семантическом представлении сообщения типа «конкуренции видов русского глагола в фактическом значении» и некоторых других случаев), с опорой на использование постулатов Грайса. В частности, предполагается, что из нескольких кандидатов на выражение необходимого смысла говорящий выбирает те единицы, которые наиболее легко и точно понимаются слушающим (что удовлетворяет грайсовской максиме о дружелюбии). Например, из глаголов *выйти*, *отойти*, *уйти* и *пойти* для фразы, описывающей, как некто покинул помещение института, с наибольшей долей вероятности будет выбран глагол *уйти*: *Н. ушел из института*. Другие глаголы, в принципе, описывают то же самое действие, однако они сообщают о каких-либо его стадиях или цели (пойти куда-либо), и их понимание в более широком смысле возможно только благодаря соответствующим импликатурам, что позволяет восстановить заложенный смысл с большим трудом или меньшей точностью. И выбор одного из перечисленных глаголов будет нежелателен (*Он пошел из института куда-то*)

или даже запрещен (*Где Н.? – Н. отошел от института*). Однако в некоторых контекстах, напротив, более предпочтительным окажется какой-либо из перечисленных глаголов: *Только он вышел из института, как ему навстречу попался директор* (в этом случае «только он ушел...» нежелательно).

Аналогичные построения могут быть сделаны для описания употребления различных граммем, в частности, видов глагола в так называемых условиях конкуренции (*Я открыл дверь и Я открывал дверь*) и т.п. (см. Борисова, Латышева 2003).

Для принятия решения о выборе единицы говорящий учитывает несколько противоречивых факторов и принимает решение на основе «взвешивания» их значимости. Аналогичным образом адресат, получая сообщение, тоже прогнозирует деятельность говорящего: выбирая из нескольких возможных вариантов понимания тот, который должен соответствовать замыслу говорящего, слушающий предполагает, для какого из этих вариантов прозвучавшая фраза оказывается самым лучшим способом выражения, а для каких «говорящий сказал бы иначе».

Предложенная модель позволяет включить в лингвистическое описание следующие понятия, соотносимые с психологическими. Во-первых, это замысел – фрагмент смысла, подлежащий отражению. Заметим, что он не полностью совпадает со значениями слов, которые используются для его передачи. Это соответствует принятому

в психологии представлению о неконгруэнтности мысли и ее вербального выражения.

Далее, находится место для многоаспектной деятельности реципиента, включающей не только распознавание и семантизацию языковых единиц, но и такие моменты, как построение имплицатур, учет деятельности говорящего и даже собственных ассоциаций реципиента.

Деятельность говорящего тоже включает в себя больше действий, чем учитывалось лингвистами, в том числе и таких, которые отмечались психологами: прогнозирование понимания вариантов сообщения реципиентом, выбор единиц с учетом общих знаний участников коммуникации, учет степени активированности фрагмента сообщения в памяти говорящих.

Использование предложенной модели позволяет расширить возможности алгоритмизации правил выбора единицы и ее понимания за счет более широкого обращения к психологическим особенностям речевой деятельности.

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НОВЫЕ ДАННЫЕ ПО СКОРОСТИ ИЗМЕНЕНИЯ ЯЗЫКОВ

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Гипотеза постоянства скорости изменения языков, выдвинутая Сводешем более полувека назад, до сих пор активно дебатруется. Данные о разной скорости лексических изменений в разных языках, приведенные в ряде работ (см. обзор Nettle D. 1999: 119–136), послужили основой общего скептицизма по поводу истинности гипотезы Сводеша. Однако коррективы, внесенные в формулировку законов Сводеша С. Старостиным (Бурлак С. А., Старостин С. А. 2001), позволяют не без успеха применять их в глоттохронологии. Вероятно, приближенно эта гипотеза все же выполняется.

Часто приводимые возражения против гипотезы Сводеша состоят в том, что языковые изменения не автономны, а зависят от истории носителей языков (Thomason S. G. and Kaufman T. 1988). Они зависят от многих социолингвистических факторов, таких, как структура социальных сетей, развитие билингвизма, мобильность и т. д., которые сильно меняются с течением времени и от общества к обществу. С другой стороны, логично предположить, что языковые процессы управляются некими когнитивными механизмами и что базовые когнитивные механизмы у всех людей одинаковые. Таким образом, исследования скорости изменения языков позволяют сопоставить вклад в эволюцию внутренних когнитивных механизмов и внешних социальных факторов.

Были предприняты попытки изучения в разных языках скорости эволюции грамматики. Из

общих соображений вроде бы следовало ожидать, что грамматика языков с большим числом носителей будет эволюционировать медленнее, так как требуется больше времени на распространение инноваций. В работе Nettle D. (1999: 119–136) эта гипотеза была проверена методом компьютерного моделирования и оказалось, что это действительно так, но только для языков с небольшим числом носителей. Проверка на реальных данных типологической базы данных WALS для 2,5 тыс. языков, проведенная в работе (Wichmann S., et al. 2007), также показала, что зависимость скорости эволюции от числа носителей если и есть, то весьма слабая. Дальнейшие исследования (Wichmann S., Holman E., 2009) эволюции грамматики на материале WALS показали, что средняя скорость изменения 80 наиболее стабильных грамматических признаков составляет 14% за 1000 лет, что точно соответствует константе Сводеша. Данные по эволюции грамматики, таким образом, скорее подтверждают гипотезу Сводеша.

Следует отметить, что все вышеперечисленные исследования проводились на небольшом числе наиболее стабильных сущностей (слов или грамматических признаков). Так, гипотеза Сводеша относится только к ядру лексики (100 или 200 наиболее стабильных лексем). В данной работе впервые оценена скорость изменения всего лексикона. Такие исследования стали возможными только недавно благодаря появлению электронной библиотеки Google Books с поисковым сервисом Ngram Viewer (<http://books.google.com/ngrams>), содержащей тексты, начиная с 1520 г. общим объемом 500 миллиардов слов на английском, русском, немецком, французском, испанском, еврейском и китайском языках. Свободно доступный корпус n-грамм позволяет проводить различные исследования по языковой динамике, в том числе оценить скорость изменений всего лексического запаса языка с течением времени.

В данной работе рассматривается скорость эволюции лексического состава с точки зрения частотно-ориентированного подхода, т.е. учитывается изменение частоты употребления слов в различные периоды. Мы ограничиваемся частотами только слов, а не произвольных 1-грамм. Из базы выделялись 1-граммы, состоящие только из букв соответствующего алфавита, за исключением, возможно, не более одного апострофа. Выбрав некоторую количественную меру различия (метрику) годовых частотных распределений, мы можем оценить скорость эволюции лексики. Нами были проведены расчеты на основе различных метрик, в том числе

l_p -норм, корреляционных расстояний, а также различных информационных метрик, в том числе метрики Махаланобиса (Гайдышев И. 2001). Наилучшие результаты даёт использование информационных метрик.

Полученное по эмпирическим данным значение меры различия формируется главным образом за счёт двух факторов. Во-первых, лексический состав языка со временем изменяется, что вызывает направленные изменения частотных распределений. Во-вторых, эмпирические частоты слов отличаются от истинных вероятностей, поэтому даже в отсутствие направленных изменений мы получим ненулевое значение меры различия. Для снижения влияния случайных факторов, во-первых, рассматриваются только те годы, на которые имеется достаточный объём данных (например, для английского языка с 1840 г.). Кроме того, для установления соотношения между случайными и направленными изменениями мы рассматриваем наряду с полным частотным распределением также усечённые распределения ограниченного объёма наиболее употребительной лексики. При имеющихся объёмах статистики для английского языка можно достаточно уверенно выделять направленные изменения лексического состава с характерным временным масштабом от 8–10 лет и более.

Нами были получены зависимости скорости изменения лексического состава для европейских языков, представленных в базе Google Books (английский язык, представленный британским и американским национальными вариантами, русский, немецкий, французский и испанский языки). Можно отметить, что для каждого языка, за исключением нескольких периодов, соответствующих крупным историческим событиям, скорость изменения лексического состава изменяется в относительно небольших пределах.

В качестве примера на рис. 1 представлен временной ряд скорости изменения лексического состава английского языка. Данные представляют собой значения метрики Махаланобиса изменений частотных распределений встречаемости слов за 10-летние периоды времени (с 1840 по 1850, с 1841 по 1851 годы и так далее). Полученные величины нормированы на величину энтропии частотного распределения, в результате получившиеся значения можно интерпретировать как ожидаемый процент изменений в лексическом составе за выбранный (10-летний) интервал времени. На графике чётко выделяются всплески, соответствующие двум мировым войнам, а также значительным

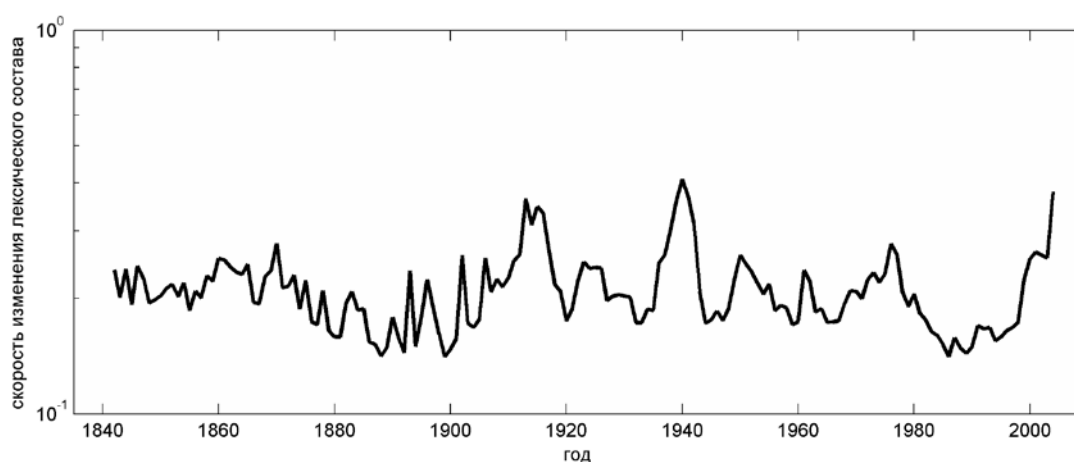


Рис. 1. Скорость изменения лексического состава английского языка, 1840–2008 гг.

изменениям лексики в последние 10–15 лет. Также можно видеть некоторое понижение скорости изменения частотного состава в годы «викторианской эпохи» (1860–1900). Однако за исключением указанных значительных выбросов, скорость изменяется в относительно малых пределах (интерквартильный размах составляет 0.061 при медианном значении 0.215, то есть типичные вариации данного параметра лежат в пределах 13–14%).

Следует отметить, что скорость и динамика эволюции лексики, применимо к нашему исследованию, зависят также от количества исследуемых лексических единиц. Чем меньше выборка наиболее употребительной лексики, тем медленнее она эволюционирует, а изменения носят более скачкообразный характер. Такое поведение отмечается и для других языков. Точное сравнение типичной скорости изменений различных языков между собой достаточно сложно, так как надо учитывать для разных языков различный объём статистики, различие

в количестве активно используемых словоформ, различия, связанные с морфологическим строем языков.

Таким образом, в рассматриваемой в работе постановке, гипотеза о постоянстве скорости изменений языка в целом подтверждается, что указывает на большую роль в эволюции языка внутренних когнитивных механизмов по сравнению с внешними социокультурными факторами.

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РОЛЬ ПРАЙМИНГА В РАЗРЕШЕНИИ ПОЛИСЕМИИ

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Проблема многозначности всегда была и остаётся в фокусе лингвистических исследований. В рамках когнитивной науки интерес к явлению полисемии вызван тем фактом, что именно полисемия даёт наиболее полный и объективный материал для решения проблем формирования

концептов и механизмов функционирования когнитивной системы человека в целом. Язык выявляет, объективирует то, как увиден и понят мир человеческим разумом, как он преломлён и категоризирован сознанием. Каждая языковая единица рассматривается как результат действия когнитивных процессов (Кубрякова 1997:38). В значении слов накапливаются и сохраняются знания об отражённом в сознании человека мире, при этом компоненты значения закреплены в семантической памяти (Лапшина 1996:66).

Многозначное слово, являясь в когнитивном плане многомерным концептуальным образованием, фиксирует значительный объём когнитивной информации, 'схваченной' его значениями. По мнению М.В. Никитина (1997:209), основания для отождествления и дифференциации производных значений внутри полисеманта коренятся в структуре и дискретизации практики. Общность действительности, общность опыта у разных людей и коммуникативной деятельности обеспечивают достаточно единообразную картину дискретизации семантических континуумов и обеспечивают достаточную общность содержательного наполнения значений. Значения многозначного слова, соотносящегося с когнитивными единицами сознания, непосредственно обусловлены структурой деятельности и человеческого опыта, они выявлены и разграничены в сознании с той степенью чёткости, с которой разработан в опыте соответствующий участок человеческой деятельности (там же).

Важнейшее значение для понимания когнитивной природы многозначности имеет применение для её исследования методов различных наук, которые составляют парадигму когнитивной науки. В настоящем исследовании используется процедура семантического прайминга для анализа процесса распознавания значений многозначного слова. Рассматривается возможность использования семантического прайминга для разрешения лексической многозначности, полисемии. Семантический прайминг включает в себя две взаимосвязанных разновидности – ассоциативный прайминг и категориальный прайминг.

В процессе своей жизнедеятельности человек бесчисленное количество раз встречается с различными контекстами употребления одной и той же лексической единицы в различных её значениях. По мнению В.И. Заботкиной (1991), слово впитывает контексты своего предшествующего употребления, и в памяти происходит фиксация всего многообразия этих различных контекстов употребления данной лексической единицы. Такое накопление контекстов

употребления идёт на протяжении всей человеческой жизни. При этом само понятие 'контекст' может трактоваться широко: это может быть и индивидуально-личностный контекст, и контекст ситуации, и широкий прагматический контекст во всём многообразии его характеристик и параметров. Каждый из данных типов контекста имеет когнитивную природу. Совокупность контекстов, ассоциируемых с некой лексической единицей, представляет собой комплексную многомерную ментальную репрезентацию, которая потенциально может фиксировать значительный объём концептуальной информации, а, по сути, любое число концептуальных доменов, которые являются релевантными для актуализации данного конкретного значения многозначного слова. Человеческая память является совокупностью подобных комплексных ментальных репрезентаций, фиксирующих информацию о типичных ситуациях, имеющих конвенциональную природу, об их потенциальных или истинных участниках, о моделях поведения, о характере и последовательности действий и т. д. Данная комплексная ментальная репрезентация, связанная категориально и ассоциативно со словом-мишенью, может выступать в виде прайма/стимула, способствующего более быстрой идентификации значения слова-мишени.

Таким образом, ментальные репрезентации, содержащие концептуальную информацию о слове-мишени, могут выступать в виде ассоциативного и концептуального прайма, способствующего более адекватной идентификации значения слова-мишени. В дальнейшем в докладе детально анализируется, каким образом взаимодействуют фреймы прайма и слова-мишени.

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ОСОБЕННОСТИ ВОСПРИЯТИЯ И ПЕРЕРАБОТКИ ИНФОРМАЦИИ ПРИ ТРЕВОЖНЫХ РАССТРОЙСТВАХ

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Актуальность

Проблема тревожности является одной из самых актуальных проблем не только медицины и психологии, но современного общества в целом. Каждый четвертый житель планеты хотя

бы раз в жизни перенес то или иное тревожное расстройство, а заболеваемость ими составляет 17,7% в год.

В основе тревожных расстройств лежит переход адаптивной тревоги в патологическую. Изменение состояния высших мозговых функций является одним из аспектов влияния патологической тревоги на состояние человека. Интенсивность тревоги сама по себе снижает возможность логической обработки информации (Березин 1988: 13–21). По мнению А. М. Вейна и Б. И. Каменецкой (1973), мнестический дефект при тревожных расстройствах связан с патологическими эмоциональными состояниями. Клинически расстройства внимания проявляются нарушением концентрации, устойчивости внимания, быстрой истощаемостью, замедленностью переключения внимания, т. е. количественными изменениями.

При тревожных расстройствах происходит и качественное изменение внимания. Пациенты с ПР характеризуются предпочтительной обработкой угрожающей информации как на перцепционном, так и на семантическом уровнях, развивается искажение имплицитной и эксплицитной памяти на слова, обозначающие телесные ощущения (Cloitre et al 1994: 225–240). Пациенты с ОКР, в клинике которых были навязчивости, связанные с постоянным мытьем, показали более длительное время распознавания слов, обозначающих загрязнение, в сравнении с нейтральными словами и наборами букв (Foa et al 1993: 173–189). Использование эмоционального теста Струпа показало трудности при обработке эмоциональных стимулов у пациентов с паническим расстройством с агорафобией (Lundh et al 1999: 222–232). Подобную закономерность пытались объяснить семантической связью слов с эмоциональным состоянием (Williams et al 1996: 3–24), но однозначной трактовки полученных результатов не получено.

Методы.

Обследованы 101 пациент с тревожными расстройствами (63 пациента с паническим расстройством (ПР), 24 пациента с фобическим расстройством (ФР), 14 пациентов с обсессивно-компульсивным расстройством (ОКР)) и 30 человек группы контроля.

Использована экспериментально-психологическая компьютерная методика определения особенностей восприятия и переработки информации (в модификации Коростелевой И. С.), основанная на прочтении испытуемым мелькающих на экране монитора слов из «поведенческого», «эмоционального»,

«когнитивного» словарей (наша модификация метода). Время экспозиции первого предъявляемого слова – 30 мс, время экспозиции последующих постоянно увеличивалось на 3 мс. Регистрировался временной показатель – порог осознания, когда испытуемый начинал правильно читать мелькающие на экране слова не менее трех раз подряд, и количественные показатели: общее число ошибок, количество пропущенных (перцепционных ошибок), искаженных (семантических ошибок) слов из каждого словаря.

Полученные результаты.

Показано достоверное увеличение времени распознавания ($p < 0,01$) как в группе тревожных расстройств в целом (68,89 мс), так и, в частности, при ПР (69,22 мс) и ФР (74,65 мс) по сравнению с группой контроля (41,50 мс).

В группе тревожных расстройств по сравнению со здоровыми достоверно чаще совершались перцепционные ошибки и реже – семантические. Та же закономерность прослеживается и при анализе ошибок в отдельных клинических группах.

Выявлена специфика распознавания слов определенного словаря: в группе ПР ошибки чаще совершались при распознавании слов из «эмоционального» и «поведенческого» словарей, в группе ФР – «поведенческого», в группе ОКР – «когнитивного» и «поведенческого».

Анализ и интерпретация.

Полученные результаты подтвердили идеи Р. Йеркса и Д. Додсона (Yerkes and Dodson 1908: 459–482), объясняющие динамику состояния когнитивных функций при тревожных расстройствах. При усилении тревоги до определенного уровня растет и интенсивность когнитивной деятельности, но дальнейшее ее повышение приводит к снижению продуктивности когнитивных функций, ухудшению внимания.

Особенности распознавания слов и структура ошибок могут быть объяснены следующим. Правое и левое полушарие ответственны на разные аспекты восприятия письменного текста: правое – обеспечивает диффузную перцепцию, восприятие на уровне смысла, образа слова, левое полушарие, специализирующееся на знаковых операциях – за счет побуквенного распознавания слов. В ситуации интенсивной тревоги наблюдается дезорганизация деятельности правого полушария (в результате т. н. «аффективной загруженности»), что ведет к дефициту правополушарной перцепции и, следовательно, компенсаторному включению левого полушария, обеспечивающего побуквенное

распознавание слов. Результат – уменьшение числа семантических, но увеличение количества перцепционных ошибок, а также времени распознавания слов.

Характеристика словарей, в которых было сделано максимальное количество ошибок, имеет связь с типом тревожного расстройства. Нарушение узнавания слов из определенного словаря можно трактовать как признак «дефектности» перцептивного поля определенной модальности у пациентов. На основании нарушения узнавания пациентами с ПР слов, обозначающих эмоции и поведение, с ФР – поведение, с ОКР – когницию и поведение, мы можем сделать предположение, что в становлении каждого из видов тревожных расстройств имеют значение специфические нарушения восприятия, в частности, нарушение дифференцировки стимулов различной модальности.

ИСКАЖЕНИЯ ВОСПРИЯТИЯ МЕСТОПОЛОЖЕНИЯ ЗРИТЕЛЬНЫХ ОБЪЕКТОВ

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Оценка взаимного расположения объектов является одной из рутинных задач зрительного восприятия. Результаты многочисленных психофизических исследований свидетельствуют о том, что определение расстояний между различными зрительными объектами сводится к оценке расстояний между центрами масс (центрами), их яркостных профилей (Morgan et al. 1990, Badcock et al. 1996, Seizova-Cajic and Gillam 2006). Согласно гипотезе Моргана и др. (1990), этот феномен может объясняться взаимным перекрытием паттернов нейронного возбуждения, вызванного соседними элементами изображения. Этой же причиной может быть обусловлено и возникновение оптических иллюзий протяженности (длины) типа Мюллера-Лайера (Брентано) и им подобных (рис. 1 А).



Рис. 1. Иллюзия Брентано (А). Образец стимула (Б), использовавшегося в экспериментах настоящего исследования.

Березин Ф. Б. 1988. Психическая адаптация и тревога. В сб: Психическая и психофизиологическая адаптация человека 21: 13–21.

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Вследствие усредняющего перекрытия паттернов возбуждения, зрительная система неспособна определять местоположение ограничительных элементов – терминаторов – стимула (концы базовых линий или вершины крыльев) независимо от соседствующих с ними дистракторов (самих крыльев или других отвлекающих объектов), что приводит к искаженному восприятию позиции терминатора, кажущегося смещенным в направлении дистрактора. Ранее нами была построена вычислительная модель (Bulatov et al. 2009), в которой предполагались два последовательных этапа обработки информации о местоположении зрительного объекта: i), выделение в пределах некоторого «окна внимания» части связанного с данным объектом паттерна возбуждения, и, ii), свертка полученного двумерного профиля с особым образом организованной весовой функцией суммирующих рецептивных полей. Использование данной модели для описания результатов психофизических экспериментов с различными модификациями фланговых дистракторов показало ее хорошую применимость (Bulatov et al. 2009, Bulatov et al. 2010). Однако, интерпретация данных, полученных в экспериментах с полными версиями иллюзорных фигур (т. е. состоящих из трех наборов терминаторов и дистракторов), была связана с существенной неопределенностью, возникающей из-за невозможности оценить по отдельности вклад каждой из частей стимула в

общую величину иллюзии. Также оставалось неподтвержденным основное предположение «центроидного» объяснения иллюзий: *возникают ли перцептуальные смещения отдельных частей стимула как таковые*, или же иллюзии протяженности определяются другими зрительными механизмами и характерны лишь для задач сравнения длин. Поэтому в настоящем исследовании нами были проведены психофизические эксперименты с отдельно взятыми элементами иллюзорных фигур (одиночный набор крыльев Мюллера-Лайера), помещенными на горизонтальной оси мнимого прямоугольника, вершинами которого являлись центры 4 референтных окружностей (рис. 1 Б). В экспериментах участвовали 4 испытуемых с нормальным зрением. Стимулы предъявлялись на экране монитора, расположенного в затемненном помещении на расстоянии 4 м от испытуемого. Были выполнены 3 серии экспериментов, в которых независимыми переменными были либо длина (от -12.5 до 12.5 угл. мин.), либо угол раскрытия ($0^\circ - 360^\circ$), либо общий наклон крыльев ($0^\circ - 360^\circ$). В экспериментах в случайном порядке использовалось по 40 значений независимой переменной; эксперименты повторялись 10 раз в различные дни.

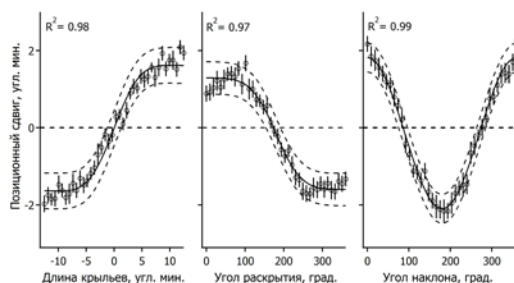


Рис. 2. Усредненные данные трех серий экспериментов. Сплошные и пунктирные линии – результаты и доверительные интервалы аппроксимации, соответственно.

При каждом предъявлении стимула от испытуемых требовалось, удерживая взгляд на

вершине крыльев, смещать референтный прямоугольник вправо-влево таким образом, чтобы его центр совпал с вершиной крыльев.

Результаты первых двух серий экспериментов аппроксимировались по методу наименьших квадратов соответствующими функциями, полученными ранее при построении нашей модели (Bulatov et al. 2009). Результаты третьей серии аппроксимировались косинусоидой (Bulatov et al. 2011). Качество аппроксимации оценивалось по величине коэффициента детерминации R^2 (Рис. 2). Параметры аппроксимации позволили определить ширину зоны суммации, или «окна внимания», соответствующего центральной части поля зрения. Расчетные значения ($3-5$ угл. мин.) достаточно хорошо совпадают с предыдущими оценками, полученными в результате регрессионного анализа данных из экспериментов с полными версиями иллюзорных фигур (Bulatov et al. 2009). Таким образом, успешность единого теоретического подхода, примененного как в настоящей работе, так и в наших предыдущих исследованиях, является весомым подтверждением обоснованности «центроидного» объяснения геометрических иллюзий.

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ЗРИТЕЛЬНЫЕ ИСКАЖЕНИЯ ВОСПРИЯТИЯ ОРТОГОНАЛЬНОСТИ

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Способность оценивать взаимную ортогональность элементов изображений является неотъемлемым свойством зрительного восприятия.

Данные многочисленных исследований (Snippe and Koenderink 1994, Gray and Regan 1996, Булатов и др. 2005) свидетельствуют о том, что и оценка, и построение прямого угла может выполняться с высокой точностью и не требует предварительного обучения. Манипуляции с острыми или тупыми углами являются гораздо более сложной задачей, и ее удовлетворительное

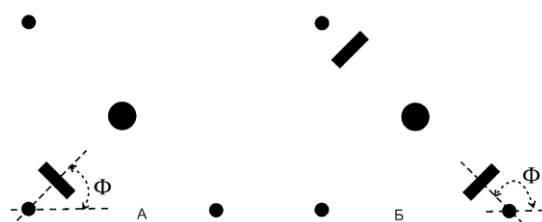


Рис. 1. Стимулы, использовавшиеся в первой (А, вращение центрального дистрактора) и второй сериях экспериментов (Б, вращение боковых дистракторов).

решение может быть получено лишь если предварительно были предъявлены образцы стимулов или их словесное описание. Исходя из этого, можно предположить, что зрительная система обладает некоторым механизмом эталонного представления ортогональности, позволяющим выделять прямой угол среди всех прочих. В настоящее время не существует общепринятого представления о природе данного механизма, однако известно (Булатов и др. 2009), что дополнение изображения прямого угла отвлекающими элементами (дистракторами) может вызывать значительные искажения его восприятия. Одним из объяснений этого эффекта может быть изменение перцептуальной локализации элементов угла, которое, как и в случае геометрических иллюзий протяженности, возникает вследствие латерального воздействия на них со стороны дистракторов. Из-за взаимного перекрытия паттернов нейронного возбуждения зрительная система неспособна определять местоположение базовых элементов стимула, формирующих прямой угол, независимо от расположенных рядом с ними дистракторов, что и приводит к искажениям при оценке величины угла.

Основываясь на «центроидной» концепции восприятия локализации (Morgan et al. 1990), нами была построена вычислительная модель, позволившая описать результаты экспериментов со стимулами, состоящими из определенным образом расположенных пятен и отрезков линий (Булатов и др. 2009). Несмотря на общую успешность моделирования, интерпретация полученных экспериментальных данных была связана с некоторой неопределенностью из-за невозможности оценить величину воздействия каждого из дистракторов по отдельности. Задачей настоящей работы являлась дальнейшая проверка предсказаний модели в экспериментах с различными конфигурациями стимулов. Как и раньше, базовыми элементами стимулов являлись три пятна, пространственные интервалы (60 угл. мин.) между которыми образовывали

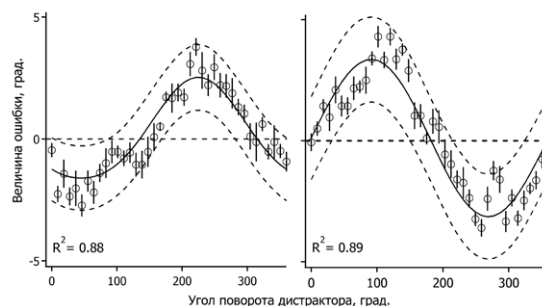


Рис. 2. Усредненные данные двух серий экспериментов. Сплошные и пунктирные линии – результаты и доверительные интервалы аппроксимации, соответственно.

катеты равнобедренного прямоугольного треугольника (рис. 1). Дистракторами служили отрезки линий, располагавшиеся либо вблизи (5 угл. мин.) центрального пятна (вершина прямого угла), либо вблизи боковых пятен. Были выполнены 2 серии экспериментов, независимой переменной являлась величина угла поворота ($0^\circ - 360^\circ$) дистракторов при их вращении вокруг соответствующих пятен. В первой серии экспериментов предъявлялся только центральный дистрактор, во второй – только 2 боковых дистрактора, причем их вращение было взаимно противоположным. В экспериментах участвовали 4 испытуемых с нормальным зрением. Стимулы предъявлялись на экране монитора, расположенного в затемненном помещении на расстоянии 4 м от испытуемого. В экспериментах, в случайном порядке, использовалось по 40 значений независимой переменной; эксперименты повторялись по 10 раз в различные дни. При каждом предъявлении стимула от испытуемых требовалось, удерживая взгляд на пятне фиксации, расположенном в середине гипотенузы мнимого треугольника, смещать боковые пятна таким образом, чтобы восстановить прямой угол.

Результаты экспериментов аппроксимировались, соответственно, функциями:

$$d_1(\varphi) = A - B \arctg \left[\frac{\tau T(\sin\varphi + \cos\varphi) - \tau}{T - \tau(\sin\varphi + \cos\varphi)} \right], \text{ и}$$

$$d_2(\varphi) = A + 2B \arctg \left[\frac{\tau \sin\varphi}{T + \tau \cos\varphi} \right],$$

где A и B – свободные параметры; φ – угол поворота дистрактора; T – длина катета треугольника; τ – предполагаемое смещение центра масс в паре пятно–дистрактор. Качество аппроксимации оценивалось по величине коэффициента детерминации R^2 (Рис. 2). Результаты аппроксимации позволили определить величину

предполагаемых перцептуальных смещений базовых пятен стимула ($\tau = 1.3 \pm 0.4$ угл. мин.), которая хорошо согласуется с оценками, полученными в результате анализа данных наших предыдущих экспериментов с восприятием ортогональности (Булатов и др. 2009) и иллюзиями протяженности (Bulatov et al. 2009). Таким образом, полученные в настоящем исследовании результаты свидетельствуют в пользу обоснованности единого «центроидного» объяснения некоторых геометрических иллюзий протяженности и искажений, возникающих при восприятии прямого угла.

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РЕЛЕВАНТНЫЕ СОЦИАЛЬНО-КОГНИТИВНЫЕ ИНДИКАТОРЫ МЕЖГРУППОВОЙ АДАПТАЦИИ В ОРГАНИЗАЦИЯХ

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Межгрупповая адаптация (МГА) в организации представляет собой процесс оптимизации взаимодействия входящих в нее групп, характеризующихся соответствующими субкультурами, основу которых составляют мотивационные, когнитивные, эмоциональные, поведенческие и интегральные компоненты. Авторская концепция МГА является теорией среднего уровня по Р. Мертону (П.А. Корчемный, 2011). Концепция МГА обоснована в ходе теоретического анализа и эмпирического исследования, проведенного в реальных условиях ВМФ России (Булгаков, 2007). Выявлены закономерности, сформулированы принципы изучения и управления, апробированы механизмы, стратегии МГА. Результативность концепции МГА подтверждена на примере организаций образования (Булгаков А.В., 2007, 2011), оказания социальной (Булгаков А.В., 2010), психологической и медицинской помощи (Булгаков А.В. и Митасова Е.В., 2005), общественных этнокультурных организациях (Булгаков А.В., Мартенс О.К., 2011). Все эти организации объединяет, во-первых, принадлежность к доминирующей организационной субкультуре «Порядок», с ее иерархичностью отношений, направленностью внутрь организации, сходной по структуре системой ценностей – понятий, относящихся к ментальной сфере «русской модели управления». Во-вторых, организации близки друг к другу основными формами проявления когнитивного компонента межгрупповых взаимодействий,

лежащих в основе генезиса МГА. В-третьих, для оптимизации управления этими организациями использовались выявленные и апробированные релевантные социально-когнитивные индикаторы МГА в организациях: коэффициент адекватности восприятие ситуации МГА ($KB^{сма}$) ее участниками (Булгаков А.В., 2007), дизайн МГА в организации (Булгаков А.В., 2011), психологическое время в организации (Климова Е.М., 2011).

1. $KB^{сма}$ ее участниками был получен в результате корреляционного анализа (R_s Спирмена) базы ситуаций МГА на кораблях ВМФ России. 62% ситуаций характеризовались их участниками как взаимодействие групп с различным статусом. В опросе участвовали 1129 военнослужащих 45 экипажей. Выборка ситуаций формировалась на основании межличностно-группового континуума Р. Брауна (2001). В результате для рассмотрения использовались 628 ситуаций МГА (табл.), в которых взаимодействующие группы получили следующие $KB^{сма}$: командование корабля – 0,879, офицеры – 0,772, мичманы – 0,371, старшины-контрактники – 0,346, старшины по призыву – 0,598, матросы – 0,771. Абсолютные величины $KB^{сма}$ определяют устойчивость группы в системе межгрупповых отношений экипажа корабля, а валентность показывает на позицию активности группы в разнообразии применяемых моделей МГА. Положительная величина $KB^{сма}$ сигнализирует о применении традиционных в организации для данной группы алгоритмов МГА, учитывающих статусное (властное) положение группы. Отрицательное значение об использовании группой других моделей, не соответствующих статусному положению группы, чаще

скрытых от внешнего наблюдателя. С помощью КВ^{сма} выявлена закономерность генезиса, которая определяется нелинейностью восприятия группами ситуаций МГА относительно своего статусного положения в экипаже. МГА проявляется как слабо рефлекслируемое, выраженное в некоем обобщенном «другом», находящемся в тени, на периферии межличностных взаимодействий, но базовое по своему социально-когнитивному содержанию явление, существенно влияющее на результативность совместной деятельности членов групп, межгрупповые отношения.

2. Социально-когнитивный индикатор «дизайн МГА в организации» обоснован на материале МГА в образовательной системе. Он представляет собой пример диверсификации социально-психологического знания. Введение индикатора вызвано тем, что практические психологи нуждаются в минимально трудоёмких, а лучше всего – экспресс-методиках диагностики и управления социально-психологическими процессами в организации. Понятие «дизайн группы» вбирает в себя основные признаки МГА: взаимодействие субкультур организации, мотивационные, когнитивные, эмоциональные компоненты групповых структур. Дизайн группы – процесс и результат оптимизации взаимосвязи социально-психологических характеристик групп: 1) мотивационного профиля групп (адаптированный вариант теста «Мотивационный профиль» П. Мартин и Ш. Ричи); 2) организационно-культурных характеристик групп (оценка организационной культуры К. Куинн и Р. Камерон); 3) идентификацию её участников и неформальные взаимоотношения («Тест социальной идентификации» А.В. Булгакова, сокращённый вариант методики анализа ситуации МГА). Результатом гармоничного дизайна групп является устойчивая, но гибкая их структура, способствующая/препятствующая МГА в организации.

3. Социально-когнитивный индикатор МГА – психологическое время в организации (Климова, 2010). Временная структура МГА выявлялась по методике А. А. Кроник и включает в себя следующие элементы: событие-начало – фиксация группой информации о состоянии социальной среды; обусловленный начальным событием процесс

МГА – ситуация МГА, барьеры социально-психологической адаптации, стратегии МГА; событие окончание предшествующего периода и одновременно начало нового периода профессиональной деятельности после завершения МГА. Указанная временная структура МГА отражает субъективное отношение к МГА, так называемая субъективная картина МГА. Объективная картина МГА является результатом наложения субъективных картин МГА всех её субъектов. Совпадение «психологического настоящего» участников МГА повышает эффект доверия, сотрудничества, приводит к росту взаимопонимания между субъектами одного уровня управления; открытости отношений, принятию и использованию идей. Увеличивается сплочение группы (эмоциональное и функциональное); проявляются общие черты (модели поведения, стереотипы, привычки); развивается позитивная взаимозависимость, взаимное дополнение и взаимное согласие (по ролям, задачам). Главное – повышается результативность деятельности за счет оптимизации использования ресурсов (делегирование, синергетический эффект). Доверие служит также источником управления группой. В свою очередь, недоверие порождает неопределенность и тревожность, ведет к ориентации на личные, а не общие цели и интересы.

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РОЛЬ ЭФФЕКТА БОЛДУИНА В ПРОИСХОЖДЕНИИ ЧЕЛОВЕЧЕСКОГО ЯЗЫКА

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Эффектом Болдуина называется такой эволюционный механизм, в ходе которого каждое эволюционное событие начинается с вариативного поведения организмов (чем бы оно ни было

обусловлено), а заканчивается закреплением в генах тех особенностей, которые способствуют оптимальной реализации наиболее адаптивного поведенческого варианта. Чем большее участие в регуляции онтогенеза принимает внешняя среда, тем в большей степени востребованным оказывается закрепление в генах не жёстко фиксированных инстинктивных поведенческих программ, а предрасположенности к тому, чтобы максимально быстро и максимально надёжно обучиться тому поведению, которое будет оптимально при заданных условиях среды. Языковое поведение не является инстинктивным, генетически заложена лишь общая способность к усвоению языка (см., например, Jackendoff 2002: 92, Kirby, Christiansen 2003), кроме того, у человека долгое детство, тем самым вероятность, что в формировании языковой способности эффект Болдуина играл значительную роль, представляется весьма высокой.

Сравнительные исследования коммуникативных систем приматов (см. прежде всего Дерягина, Васильев 1993) показывают, что в ходе эволюции происходит как общее увеличение числа сигналов, так и перераспределение долей сигналов разного типа в коммуникативном инвентаре; увеличивается количество дружелюбных сигналов, усиливается связь жеста и звука в дружелюбной области общения; у наиболее близких к человеку видов появляется возможность «объединять элементы в комплексы и перекомбинировать их в новой ситуации» (Дерягина, Васильев 1993: 69) – отчетливее всего она проявляется у бонобо в дружественных социальных контактах. Хотя звуковые сигналы человекообразных обезьян являются врождёнными (см., например, Гудолл 1992) и, видимо, неподконтрольны (или почти неподконтрольны) воле, они позволяют до некоторой степени ориентироваться в реалиях окружающего мира – разные объекты вызывают разные звуки, и обезьяны могут интерпретировать эти звуки как связанные с разными объектами (см., например, Clay, Zuberbühler 2009). Кроме того, человекообразные обезьяны обладают когнитивным потенциалом, необходимым для создания сигналов *ad hoc*, и создают такие сигналы (см., например, Гудолл 1992).

Чем больше существует факторов внешней среды, которые невозможно предсказать настолько задолго, чтобы успеть генетически закрепить реакции на них, тем более востребованным становится поведенческое приспособление. В новых экологических нишах, которые осваивали гоминиды, способность быстро формировать новые поведенческие программы и передавать их соплеменникам была жизненно важна. С развитием производства орудий количество доступных

поведенческих программ все более и более возрастало – соответственно, все сложнее было не только эффективно передавать сородичам эти программы, но даже просто ориентироваться в них, разбираться, когда какую осуществлять.

Изготавливать орудия умели уже поздние австралопитеки (Semaw et al. 2003), и у их потомка (*Homo habilis*) сформировались характеристики, способствовавшие их регулярному изготовлению (трудовая кисть). Регулярное изготовление орудий, ношение их с собой и использование в разнообразных ситуациях, во-первых, увеличивали число возможных поведенческих моделей, в которых надо было ориентироваться, а во-вторых, создавали проблемы для производства (а на самом деле, и восприятия) жестовых сигналов. Соответственно, выигрыш должны были получить те группы, в которых наибольшее число особей научилось извлекать максимум пользы из звуковой составляющей коммуникации. Для этого необходимо развитие мозга – и если ранние *Homo* достаточно вариативны по размеру мозга и другим его параметрам (Дробышевский 2007), то у их потомков – архантропов – мозг существенно увеличился (а вариативность его сильно уменьшилась); сформировался рельеф в области зоны Брока.

Для архантропов, изготавливавших ашельские орудия, судя по всему, была актуальна разделка туш (Schick, Toth 1993). Это означает, что им приходилось много перемещаться (ср. Bickerton 2009), – соответственно, перед ними встала задача передавать звуковые сигналы на ходу. И действительно, если у архантропов позвоночный канал узкий, то у их потомка – *Homo heidelbergensis* – позвоночный канал становится широким, что соответствует расширению возможностей для более тонкого управления дыханием. Вероятно, они могли производить сигналы, состоящие более чем из одного слога, выйдя тем самым за пределы обязательных голофраз и обретя предпосылки для развития морфологии и синтаксиса (как средства ввести соотношения между сигналами в рамках одной реплики).

Гейдельбергский человек (см. Зубов 2004 с лит.) умел изготавливать копья и охотиться, жить в зоне умеренного климата (а значит, пользоваться огнём и изготавливать одежду), строил каменные жилища с очагами; всё это увеличивало набор используемых поведенческих программ и повышало спрос на развитие коммуникативной системы, предоставляющей информацию о тех деталях окружающего мира, которые релевантны для правильного их выбора.

Производство многосложных звуковых сигналов делало необходимым максимальное

различение звуков внутри сигнала – как в производстве, так и в восприятии. У гейдельбергского человека формируется новая область лучшей слышимости – на тех частотах, которые современные языки используют для фонемных различий (Martínez et al. 2004). Но если *Homo heidelbergensis* по этому признаку вариабельны, то у их потомка – неантропа – генетически закреплена такая форма слуховых косточек, которая обеспечивает надёжное распознавание фонемных различий; для надёжного же воспроизведения этих различий формируется опущенная гортань.

Обратный порядок – сначала обретение в результате случайной мутации хорошо приспособленной для изготовления каменных орудий кисти, более развитого мозга, более широкого позвоночного канала и т.д., а затем употребление всего этого для изготовления орудий и развития звучащей речи, – представляется маловероятным.

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ФАЗОВЫЕ ВЗАИМОДЕЙСТВИЯ МЕЖДУ ГАММА-РИТМОМ И НИЗКОЧАСТОТНЫМИ РИТМАМИ ЭЭГ ПРИ ВОСПРИЯТИИ ЧЕЛОВЕКОМ КОРОТКИХ ИНТЕРВАЛОВ ВРЕМЕНИ

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Изучение природы и механизмов сознания является актуальной междисциплинарной проблемой. Важным аспектом этой проблемы является выяснение механизмов функционального объединения пространственно удаленных популяций нейронов в процессе осуществления сознательной деятельности. Работами М.Н. Ливанова (Ливанов 1971) и его учеников показана важная роль в этих процессах пространственной частотной синхронизации электрической активности мозга. Однако такой механизм объединения нейронов невозможен, если частотные параметры электрической активности нейронных популяций значительно различаются. В этих случаях существенную роль в функциональном объединении нейронов могут играть фазовые взаимодействия, которые, вероятно, проявляются во взаимодействии между разными ритмами ЭЭГ. Вместе с тем роль этих взаимодействий в функциональном объединении нейронов, в системной деятельности мозга практически не изучена. Учитывая

это, в задачу настоящего исследования входило изучение фазовых взаимодействий между гамма-ритмом и низкочастотными ритмами ЭЭГ при выполнении человеком интеллектуальной деятельности, связанной с восприятием коротких интервалов времени.

В исследованиях участвовали добровольцы, практически здоровые юноши (7 человек) и девушки (14 человек) в возрасте от 18 до 26 лет, учащиеся томских вузов. В ходе предварительного обследования с помощью тестов Г. Айзенка (Айзенк 2001) исследовали вербальный и невербальный интеллект, а также уровни экстраверсии и нейротизма. С помощью батареи стандартных тестов исследовали особенности латеральной организации мозга с определением ведущей руки и речевого полушария (Кок и др. 1971). Для решения поставленных задач проведены 2 серии наблюдений с репродукцией и отмериванием интервалов времени длительностью 200 и 800 мс при наличии и в отсутствии обратной связи о результатах деятельности. Интервалы времени в одной серии задавались невербальными стимулами (светлый квадрат со стороной 2 см, появляющийся в центре затемненного экрана монитора), в

другой – цифрами (при отмеривании длительности). В качестве сигнала обратной связи использовали выраженную в процентах относительную ошибку репродукции или отмеривания заданного интервала времени. ЭЭГ записывали с помощью 24-канального энцефалографа-анализатора в следующих отведениях: Cz, Fz, Pz, F3, F4, C3, C4, P3, P4, T3, T4, T5, T6, O1, O2 по системе «10–20%». Объединенный референтный электрод устанавливался на мочки левого и правого уха испытуемого, а заземляющий фиксировался на запястье правой руки. С целью исключения артефактов, связанных с движением глаз, регистрировали ЭОГ. Электроды для записи ЭОГ устанавливали на верхнее и нижнее веко левого глаза испытуемого. При вводе аналоговых сигналов в ЭВМ частота дискретизации составляла 250 Гц. С целью контроля мозгового происхождения гамма-ритма использовали метод дипольной локализации. При изучении фазовых взаимодействий между гамма-колебаниями и низкочастотными составляющими ЭЭГ использовали вейвлетный биоспектральный анализ и подсчитывали функцию бикогерентности (Короновский, Храмов 2003). В качестве интегральной характеристики уровня фазовых взаимодействий между гамма-ритмом и низкочастотными составляющими ЭЭГ (0.5–30 Гц) использовали полусумму значений этой функции в исследуемом частотном диапазоне ЭЭГ (0.5–70 Гц). При анализе корреляционных связей между исследуемыми показателями подсчитывали ранговый коэффициент корреляции Спирмена. Для оценки влияния исследуемых факторов («пол», «режим деятельности», «этап деятельности») на фазовые взаимодействия использовали многофакторный дисперсионный анализ для повторных наблюдений.

Проведенные исследования позволили обнаружить существование фазовых связей между гамма-ритмом и низкочастотными ритмами ЭЭГ. Чаще всего тесные фазовые связи наблюдаются между гамма-ритмом частотой от 30 до 40 Гц и альфа-, бета- и тета-активностью мозга. Значения функции бикогерентности на этих частотах превышают 0.8. Дисперсионный анализ показал, что на изучаемые фазовые взаимодействия существенное влияние оказывают пол испытуемого, вид и этап выполняемой деятельности. Обнаружены статистически значимые корреляции между уровнем исследуемых фазовых взаимодействий и показателями интеллекта, экстраверсии, нейротизма и латеральной организации мозга. Оказалось, что характер обнаруженных корреляций отличается у юношей и девушек, зависит от вида и этапа выполняемой деятельности. Например, у девушек при репродукции

длительности стимулов с обратной связью на этапе за 100 мс до начала стимула обнаружены отрицательные корреляции уровня фазовых связей с показателями экстраверсии ($r = -0.63 \div -0.84$, $p < 0.01$) и нейротизма ($r = -0.59 \div -0.63$, $p < 0.01$), и положительные – с коэффициентом правого уха ($r = 0.55$, $p < 0.05$). У юношей в тот же период деятельности обнаружены положительные корреляции уровня фазовых связей с показателями интеллекта ($r = 0.76 \div 0.90$, $p < 0.01$), мануального предпочтения ($r = 0.78$, $p < 0.03$) и коэффициентом правого уха ($r = 0.82$, $p < 0.02$). Обнаружены также статистически значимые положительные и отрицательные корреляции уровня фазовых связей с относительной ошибкой репродукции и отмеривания коротких интервалов времени. Оказалось, что и общая численность, и уровень этих корреляций отличаются у юношей и девушек, зависят от места отведения, вида и этапа выполняемой деятельности. Причем уровень найденных корреляций варьировал по абсолютной величине от 0.56 до 0.94 ($p = 0.05 \div 0.003$).

Таким образом, проведенные исследования показали, что изучаемые фазовые взаимодействия информативны и отражают и вид, и этап выполняемой деятельности, и индивидуальные особенности человека, от них зависит и точность восприятия времени. Вероятно, эти взаимодействия характеризуют процессы внутримозговой интеграции и их динамику при выполнении предлагаемой деятельности. Существенный интерес представляет выяснение, каким образом формируются указанные фазовые взаимодействия. Высокая скорость изменения обнаруженных фазовых взаимодействий позволяет думать, что эти взаимодействия могут быть не только результатом синаптического облегчения, но также дистантных полевых взаимодействий между нейронами, на возможное существование которых указывают некоторые литературные данные (McFadden 2002).

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ОСОБЕННОСТИ ГЛАЗОДВИГАТЕЛЬНЫХ РЕАКЦИЙ У РАЗЛИЧНЫХ ГРУПП ПСИХИАТРИЧЕСКИХ БОЛЬНЫХ

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Способность совершать движения глаз не зависит от уровня образования человека, развития его вербальных и мануальных умений и навыков (Колесникова 2006). Этот факт выступает весомым аргументом в пользу применения окулографии в биологической психиатрии как одного из эффективных методов исследования. На сегодняшний день характерные нарушения глазодвигательных реакций (ГДР) выявлены у больных с психиатрической и неврологической патологией (Gooding and Basso 2008).

У больных шизофренией, пациентов с шизотипическим расстройством и лиц с повышенным риском развития шизофрении доказано повышение, по сравнению с контролем, процента ошибок при выполнении заданий на антисаккады при производстве саккад по памяти (Gooding and Basso 2008) и характерные особенности при выполнении задач по просмотру и визуальному поиску. Кроме того, согласно одной точке зрения (Fukushima et al. 1988, Gooding et al. 1997), способность больных шизофренией точно устанавливать местонахождение перемещенной цели не нарушена, однако другие исследователи (Clementz et al. 1994) показывают, что при данной патологии отмечается дисметричность саккад. Изучение ГДР у пациентов с расстройствами настроения первоначально проводили в смешанных группах (с различными типами данных расстройств) (Gooding and Basso 2008). Возможно, по этой причине существенных различий в характеристиках саккад по сравнению с контролем выявлено не было. Позже у пациентов в группе с биполярным расстройством и депрессией с психотическими признаками обнаружили повышенный процент ошибок при выполнении антисаккад, а также удлинение латентного периода (ЛП) при выполнении корректирующих антисаккад (Gooding and Basso 2008). Эти же авторы указывают на то, что у больных с большим депрессивным расстройством показано снижение глазодвигательной активности только в острой фазе заболевания. У пациентов с биполярным расстройством наблюдали точные саккады по памяти и увеличение ЛП антисаккад, что свидетельствует о некоторой заторможенности процессов без нарушения памяти. Grootens с коллегами (2008) показал

увеличение процента ошибок у пограничных пациентов с психотическими симптомами по сравнению с пациентами данной группы без психотических симптомов, что, по его мнению, может быть диагностическим критерием приближающегося психоза. При тревожных расстройствах (Bar-Haim et al. 2007), в основном, при обсессивно-компульсивном расстройстве (ОКР), у пациентов параметры вызванных саккад на зрительный стимул соответствуют норме, но процент ошибок при выполнении заданий на антисаккады больше, чем в группе здоровых лиц. Особую актуальность изучение движений глаз у больных с тревожными расстройствами приобретает в связи с относительно высокой распространенностью – по данным разных авторов, колеблется от 3 до 30% (Вейн 2000). Также в литературе имеются сведения о трудностях в диагностике тревожных расстройств и описывается тенденция к гиподиагностике, связанная с тем, что в клинической картине заболевания чаще всего на первый план выходят не психические, а соматические или неврологические составляющие тревоги.

Таким образом, составление профиля глазодвигательных реакций для различных типов нарушений данной группы, может оказать помощь в их дифференциальной диагностике.

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МАТРИЦА БЕССОЗНАТЕЛЬНОГО КАК ПРОГРАММА ПОВЕДЕНИЯ (НА МАТЕРИАЛЕ ТЕКСТОВ РУССКОЙ ЛИТЕРАТУРЫ СРЕДНЕВЕКОВЬЯ И НОВОГО ВРЕМЕНИ)

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1. Понятие «коллективного бессознательного» введено в науку швейцарским психоаналитиком К. Г. Юнгом и сегодня принято большинством гуманитариев, работающих с проблемой «человек и порожденные им тексты». Между тем Юнг говорил о «крайней молодости» науки, которой он посвятил жизнь, о том, что она «еще не покинула своей колыбели» (1994: 12). Это означает, что в сфере психоанализа многое нуждается в верификации, равно как и то, что ученым, использующим инструментарий данной научной дисциплины, предстоит сделать не одно открытие в сфере феномена коллективной психики.

Практикующий психоаналитик имеет дело с пациентом и его текстом (в том числе и поведением как текстом) здесь и сейчас. Как быть исследователю, антропологу, имеющему дело с историческим прошлым, от которого остались лишь «ментальные продукты» – тексты, созданные людьми, ушедшими в мир иной? Есть ли возможность сделать человека, описанного в сочинениях прошлого, его душу, ментальность, судьбу предметом глубинного психоанализа? Обнаружима ли в нарративе семантика бессознательного? Ответы даны в трудах основателей психоанализа и авторов, которые подвергли тексты культуры исследованиям «по Фрейду», «по Юнгу», «по Адлеру» и т. д.

2. В докладе представлена попытка обобщения результатов психоанализа текстов русской литературы XI–XX веков (см.: Васильев 2009). Нас будет интересовать связь между глубинным, бессознательным состоянием человека и его поступками, из череды которых в конечном итоге складывается жизненный путь.

На основании исследования сочинений отечественной литературы нами реконструирована архетипическая система / матрица, основной функцией которой является текстопорождение – генерирование произведений, обладающих общей архетипической структурой. Существенно, что глубинное сходство прослеживается и между произведениями, относящимися к разным типам культур – средневековой и новой.

2.1. Содержательным выражением названной матрицы является сюжет-архетип о Христе и Антихристе.

Образы и жизнеописания Сына Божия и его противника / ложного двойника обладают разной степенью бессознательности. Жизнеописание Христа уже более двух тысяч лет стоит в центре христианской культуры, сюжет об Антихристе никем и никогда не написан. С разной степенью полноты он реконструирован богословами и учеными.

Жизнеописание Христа и Антихриста предстает как система бинарных оппозиций.

Христос, богочеловек, рожден непорочно от Пречистой Девы. Антихрист, «человек греха», зачат в блудной, незаконной связи и рожден блудницею.

Антихрист является в облике (маске) Христа и выдает себя за Сына Божия. Он творит чудеса, но сила чудотворения дарована ему дьяволом. Он убийца, лжец и соблазнитель в основных своих деяниях (функциях). Его цель – узурпация власти Христа.

Сын Божий искупает мученической смертью первородный грех. Его личная жертва открывает врата в Царство Небесное. Антихрист погибает в конфликте с Христом и наследует бездну, ад. По одной из апокрифических версий он бросается вниз головой с высокой горы при приближении Христа, т. е. за ним закреплена функция самоубийства.

Жизнеописание и образ Сына Божия породили варианты различных жизненных практик служения / уподобления Ему. Соответственно, в литературе – большое количество агиографических сочинений, прежде всего житий; в новой литературе на этой основе формируются типы так называемых идеальных, положительных героев.

Жизнеописание и образ человеконенавистника, Антихриста в свою очередь структурируют пространство антимира – греха-зла-блуда-болезни... На основе сюжета-архетипа об Антихристе возникает внушительное количество текстов отечественной литературы (от классических до маргинальных), в центре которых – фигура «героя-злодея». В этом случае также первична жизненная практика – *бессознательная ориентация на образец*, литературный же текст вторичен, он – её выражение.

3. Главная часть доклада посвящена феномену проявления в глубинах психики архетипа

Антихриста, таящего бессознательную программу осуществления зла.

Начальным мотивом личностной трагедии для героя является знание о собственном незаконном рождении. (Вариант: герой не знает, что он незаконнорожденный, но его психологическая природа выдает его как представителя антимира. Таков герой поэмы «Мертвые души» Чичиков, родившийся «ни мать, ни в отца, а в проезжего молодца», – первый в ряду мертвых душ, «черт, а не человек», уподобленный автором Антихристу. Не случайно Гоголь не справился с задачей воскресения, т.е. преобразования духовной природы Чичикова.) В частности, в данный ряд героев входят – Святополк Окаянный (борисоглебский цикл, XI век), Иван Грозный (повесть А. Курбского «История о великом князе Московском», XVI век), Сусанна (повесть И.С. Тургенева «Несчастная»), Дмитрий Нежданов (его же роман «Новь»), Павел Смердяков (роман Ф.М. Достоевского «Братья Карамазовы»), Иуда (рассказ Л. Андреева «Иуда Искарот»), Спирька Расторгуев (рассказ В.М. Шукшина «Сураз»). Судьба / жизненный путь всех этих героев характеризуется через вариации комплекса мотивов, тождественных архетипу Антихриста, равно как они уподоблены ему и в смерти: все герои – самоубийцы (кроме Святополка и Грозного, но и их смерть описывается через мотив Божьего возмездия). Что касается Гоголя, Тургенева, Достоевского, Шукшина, то названные их произведения пронизаны системными связями с их творчеством и «национальным текстом» в целом и несут основополагающие характеристики русской цивилизации как духовного / ментального явления.

Процедура выведения из бессознательного архетипа Антихриста позволяет проявить впечатляющий объем скрытой ранее информации и на ее основе понять сущность многих личностных и коллективных русских катастроф. В частности, у Тургенева и Достоевского *выблядком* предстает «новый человек», за которым «новое слово» – идеология нигилизма и революции, обротившая и его, и всю Россию на самоубийственный путь.

Если говорить о христианской цивилизации, то выявленная архетипика позволяет уяснить тот факт, что Христос и Антихрист – два полюса коллективного бессознательного. (Ср. отождествление Юнгом бессознательного с богом и дьяволом.) И человек и нация подчинены его мощнейшим психическим энергиям, которые действуют как программы поведения. Их функция – строить или рушить судьбы. Поэтому важнейшей и личностной, и национальной, и цивилизационной проблемой является *проблема выбора: либо Христос, либо Антихрист, либо жизнестроительство, либо самоуничтожение / полное перерождение*. Со временем (к своему большому удивлению) пришлось убедиться, что границы матрицы коллективного бессознательного в христианской культуре определяются данным сюжетом и что анализ матрицы других выводов не предоставляет. По крайней мере, выйти за их пределы не удастся.

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ОПЫТ КОГНИТИВНО-СТИЛЕВОГО АНАЛИЗА АРГУМЕНТАТИВНОГО ДИСКУРСА

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В анализе построения дискурса (в частности, аргументативного) важен учет психологических особенностей языковой личности (ЯЛ), в частности, когнитивного стиля. Понятие когнитивного стиля используется с тем, чтобы обозначить (а) индивидуальные различия в процессах переработки информации и (б) типы людей в

зависимости от особенностей организации их когнитивной сферы.

В рамках теории когнитивных стилей выбран параметр *когнитивная сложность / когнитивная простота* (далее, соответственно, КС / КП). КС-личности обладают высокими дифференцированностью и интегрированностью когнитивной системы, а КП-личности – низкими когнитивной дифференцированностью и интегрированностью.

В докладе рассматриваются результаты эксперимента по интерпретации ЯЛ

аргументативного дискурса (АД), и построения ими собственной аргументации.

АД понимается как тип стратегического дискурса, построенный по типу макрофрейма с многоуровневой структурой, равной Аргументативному Ходу, который состоит из нескольких элементарных аргументов (Аргументативных Шагов), выдвигаемых в защиту одного Макротезиса.

В исследовании использован структурно-функциональный подход к АД, по которому текст-аргумент состоит из: (А) аргументативных Шагов (комплексов аргументативно-функциональных элементов), в рамках которого вслед за (Toulmin 1958; Crable 1976) можно выделить основные – Данные и Тезис – и второстепенные – Основание, Свидетельство, Ограничитель и Оговорка); (Б) аргументативных Ходов (совокупностей аргументативных Шагов, объединенных общностью глобального Тезиса); (В) аргументативных Макроходов (последовательностей аргументативных Ходов). Выделяются 4 функциональных типа Тезисов – *декларативные, модальные, классификационные, оценочные*; 3 типа Данных – *ситуации, сообщения о ситуациях, выражения мнений*; 4 типа Оснований – *сравнения, группировки, каузальности и авторитета*.

В эксперименте исследовались когнитивные стили респондентов и интерпретация ими АД. В эксперименте были задействованы 200 студентов Калужского государственного университета обоих полов (приблизительно в равном соотношении) в возрасте 17–23 лет.

Цель эксперимента – сравнение использования аргументативных структур личностями, характеризующимися разными полюсами стиля КС / КП. Задачи: (а) анализ аргументативных функций текстов-аргументов у КС- и КП-личностей; (б) выделение аргументативных особенностей структурирования дискурса ЯЛ в зависимости от их принадлежности к тому или иному полюсу названного стиля.

Респондентам было предложено проанализировать аргументативный текст газетной статьи и выполнить задание: «Изложите проблемы текста, которые автор пытается обосновать, и их аргументацию». Результаты исследования таковы.

Лингвоаргументативные особенности дискурса КС-респондентов.

1. Четко указываются Основания в аргументах.

2. Среди Оснований преобладают Основания каузальности. В 74 дискурсах из общего количества Оснований

(316) – 197 Оснований Каузальности (62,3% от всех Оснований), 98 Оснований Группировки (31%), 21 Основание Сравнения (6,7%)

3. Среди Тезисов преобладают модальные и оценочные Тезисы. В 74 дискурсах из общего количества Тезисов (323) – 104 Оценочных (32,2%), 116 Модальных (35,9%), 49 Классификационных (15,2%), 54 Декларативных (16,7%).

4. Большинство имплицитных интенций автора не остаются незамеченными и эксплицируются в тексте КС-респондентов. Так, одно из имплицитных Оснований исходного текста эксплицируется как Основание у 42 респондентов из 74 (56,8%), как Тезис у 21 респондента (28,4%), и не эксплицируется у 11 респондентов (14,8%).

5. КС-респонденты активно используют Оговорки и Свидетельства и практически не используют Ограничителей. Одна Оговорка присутствует в дискурсах у 12 респондентов (16,2%), две – у 39 респондентов (52,7%), три – у 23 респондентов (31,1%). Одно Свидетельство присутствует в дискурсах у 21 респондента из 74 (28,4%), два – у 33 респондентов (44,6%), три – у 17 респондентов (22,9%), более трех – у 3 респондентов (4,1%). Ограничители отсутствуют у 53 респондентов из 74 (71,6%)

6. Аргументативный фрейм состоит из макротезиса, помещенного в начало дискурса, и ряда макропосылок, для защиты которых приводится единичная и реже множественная аргументация. Имеется гипертезис в начале дискурса у 63 респондентов (85,1%).

Лингвоаргументативные особенности дискурса КП-респондентов.

КП-респонденты не перестраивают порядок следования аргументов услышанного текста. Не все эксплицитно выраженные Тезисы, Данные и Основания находят отражение в их интерпретациях. Их стратегия – опущение. Наличие Ограничителей свидетельствует о более низкой степени уверенности в истинности Тезисов по сравнению с КС-респондентами. В интерпретации КП-респондентов:

1. Не всегда четко приводятся Основания в Аргументах (есть Шаги, где Основания имплицитны). Из 110 респондентов 3–5 имплицитных Основания используют 64,5% испытуемых, 6 и более – 23,6% испытуемых с данным полюсом стиля.

2. Среди Оснований преобладают Основания Группировки. Из общего количества Оснований (753) – Оснований Каузальности в 110 дискурсах – 176 (23,4%), Оснований

Группировки – 428 (56,9%), Сравнения – 118 (15,7%), Авторитета – 31 (4%).

3. Респондент использует разные типы Тезисов почти в равных долях. Из общего количества Тезисов в 110 дискурсах (749) – декларативных 235 (31,4%), оценочных – 241 (32,2%), модальных – 245 (32,7%), классификационных – 28 (3,7%).

4. Большинство имплицитных интенций автора остаются незамеченными и не эксплицируются в тексте КП-респондентов; многие функции аргументов автора статьи опускаются в интерпретации; так, упомянутое Основание исходного текста не эксплицируется у 72 респондентов из 110 (65,5%), эксплицируется – у 38 (34,5%).

5. КП-респонденты практически не используют Оговорки и Свидетельства, активное использование Ограничителей со значением «предположения» передает неуверенность

респондентов в высказываемом мнении. Оговорки использовали 6 респондентов из 110 (5,5%), Свидетельства – 2 из 110 (1,9%). Два Ограничителя встречаются в дискурсах 97 респондентов (88,2%), три Ограничителя – у 11 (10%), четыре Ограничителя – у 2 (1,8%).

6. Аргументативный фрейм состоит из макротезиса, помещенного в конец дискурса, и ряда макропосылок, для защиты которых приводится единичная и реже – множественная аргументация. Наличие гипертезиса в конце дискурса – у 78 респондентов из 110 (70,9%), отсутствие гипертезиса в дискурсе – у 26 респондентов (23,6%), наличие гипертезиса в начале или середине дискурса – 6 респондентов (5,5%).

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ИНТЕНСИФИКАЦИЯ КАК КОГНИТИВНО-ДИСКУРСИВНАЯ КАТЕГОРИЯ

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Экспрессивность представляется одной из закономерностей развития языка, определяющей постоянное семантическое или функциональное обновление языковых элементов. Экспрессивность в языке обусловлена прагматическими факторами, поскольку процесс коммуникации неизбежно осложняется разноплановой информацией, зависящей от характера отношений между говорящими, их ролей, социального статуса и, конечно же, их эмоционального состояния. Многие языковые элементы вводятся в дискурс и используются благодаря стремлению говорящего проявить оригинальность самовыражения, передать интенсивность переживаемых эмоций и тем самым усилить прагматическое воздействие высказывания на адресата.

Экспрессивность находит свое выражение в способах интенсификации семантики языковых элементов различного порядка, и эти способы имеют собственно лингвистическую природу.

Средства, усиливающие интенсивность семантики языковых элементов, чрезвычайно разнообразны. Наиболее выразительными в

этом отношении являются наречия, а именно их особая семантическая подгруппа – наречия-интенсификаторы, которые определяют как наречия степени, усиливающие семантику синтаксически связанных с ними языковых единиц [1; 4]. Метафорически характеризуя дискурсивную функцию наречных интенсификаторов, Дж. Мартин и Д. Роуз отмечают, что они «усиливают громкость звучания» семантики языкового элемента [3, с.38]. Несомненно, дискурсивная функция интенсификаторов связана с их значением. Благодаря своей способности «усиливать громкость звучания» семантики языковой единицы, они служат особыми операторами коррекции отношения говорящего к высказыванию и позволяют ему не только модифицировать интенсивность высказывания или его отдельного элемента, но и смещать фокус высказывания и изменять его эмоционально-оценочную окраску. В этом случае обнаруживается очевидная связь интенсификации и оценочности в языке.

Кроме того, интенсификаторы, функционирующие в качестве определений прилагательных или наречий, позволяют выстроить шкалу градаций оценки (от умеренной до максимальной) для соответствующих прилагательных и наречий, указывая, в какой степени относительно определенного/ожидаемого стандарта присутствует выраженное ими качество.

Важно подчеркнуть, что интенсификация семантики языковых единиц неразрывно связана с языковой инновацией. Очевидно, что в результате постоянного употребления и последующей конвенционализации семантики интенсификатора происходит «выцветание» (*bleaching*) его значения и, соответственно, снижение прагматической эффективности в речи. Таковыми в английском языке являются конвенциональные интенсификаторы, образующие закрытый, устоявшийся в количественном отношении класс: *so, very, too, more interesting/boring/careless, etc.* Поэтому в языке постоянно происходит своеобразный процесс «повторной семантической переработки» [2] уже имеющихся значений, в результате которой создаются новые, более яркие интенсификаторы. Они образуют открытый класс интенсификаторов, постоянно пополняющийся новыми лексическими единицами. Интенсификаторы, принадлежащие этому классу, зачастую используются в метафорическом значении и поэтому несут дополнительную прагматическую нагрузку. Например, наречие образа действия *perfectly* (= in a perfect way, manner) также может функционировать и в качестве интенсификатора со значением ‘совершенно, полностью, абсолютно’, когда служит определением прилагательного. Например: *perfectly normal/clear/safe*. Подобным же образом наречие реальности *really*, с одной стороны, может подчеркивать соответствие содержания пропозиции действительности, а с другой – может

служить интенсификатором, корректируя интенсивность семантики прилагательного как в *really safe/helpful*. Таким образом, открытый класс интенсификаторов эффективно пополняется представителями других классов наречий. Кроме того, новые интенсификаторы открытого класса образуются в результате процесса деривации от эмотивных прилагательных, например: *stunningly complex, pathetically small, hideously expensive, etc.*

В докладе будет показано функционирование интенсификаторов английского языка, принадлежащих как к закрытому (конвенциональному), так и к открытому (пополняющемуся) классу, в электронном корпусе, представленном текстами профессионального дискурса. Будет показана взаимосвязь дискурсивной функции интенсификаторов с их значением, а также со значением определяемых ими языковых элементов. Также будут показаны и прокомментированы когнитивные механизмы образования новых наречных интенсификаторов открытого класса.

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ЕСТЬ ЛИ СЕМАНТИЧЕСКИЙ КОМПОНЕНТ В ЭФФЕКТЕ ПРЕВОСХОДСТВА СЛОВА?

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Эффект превосходства слова (ЭПС) можно определить как повышение эффективности отчета о букве в составе слова по сравнению с изолированным предъявлением и предъявлением в составе случайного набора букв. Данный эффект был впервые описан в конце XIX века Дж. М. Кеттеллом (Cattell, 1886), а методический аппарат для его изучения, принятый в современных исследованиях, был предложен независимо друг от друга Дж. Рейхером и Д. Уилером (Reicher, 1969; Wheeler, 1950).

Среди объяснений ЭПС лидирующие позиции занимают, с одной стороны, коннекционистская модель интерактивной активации (IAM) (McClelland, Rumelhart, 1981), а с другой – каскадная модель двух путей (DRC) (Coltheart et al., 2001). В первой из моделей эффект выступает как следствие знакомости слова как целостной перцептивной единицы наблюдателю и возникает благодаря наличию петель обратной связи от уровня анализа слова к уровню анализа букв, что открывает возможность для обратного (нисходящего) распространения активации от слова к его составным элементам. Во второй модели эффект рассматривается прежде всего как следствие орфографической упорядоченности букв в составе слова, позволяющей осуществить его фонологическое кодирование и за счет этого

облегчить опознание слова в целом и его отдельных элементов. Однако до сих пор остается без ответа вопрос о том, является ли ЭПС одним из перцептивных эффектов контекста, к числу которых относится, например, «эффект превосходства конфигурации» в зрительном поиске (Pomerantz et al., 1977), или для его возникновения важно то, что слово представляет собой единицу ментального лексикона, имеющую определенное значение. Иными словами, накопленные к настоящему моменту данные не позволяют однозначно сказать, имеет ли ЭПС не только структурно-перцептивный и, возможно, фонологический, но и семантический компонент. Еще один вопрос, который ставится в данной работе, заключается в том, может ли ЭПС выступать не только как проявление, но и как объект нисходящих влияний на обработку зрительной информации. Для ответа на эти вопросы мы синтезировали стандартную методику исследования ЭПС Рейхера-Уилера (Reicher, 1979) с процедурой получения неосознаваемого семантического прайминг-эффекта (см., напр., McNamara, 2005).

В качестве стимулов были использованы три набора по 20 слов (слова были подобраны таким образом, что при замене центральной буквы они образовывали другое осмысленное слово: напр., «коШка – коЧка», чтобы можно было получить ответ путем двухальтернативного вынужденного выбора), на основе которых были составлены два набора по 20 неслов (неслова были получены заменой 2–3 букв исходного слова, а также факультативной перестановкой 1–2 букв, так что в итоге получался нечитаемый набор гласных и согласных). Слова были уравнены по частоте встречаемости в русском языке. В эксперименте сравнивалась эффективность опознания буквы в пяти условиях:

- в составе слова с предшествующим ему замаскированным словом-праймом, связанным по смыслу с данным словом (например, «весло – лодка»);
- в составе слова с предшествующим ему замаскированным словом-праймом, не связанным по смыслу с данным словом (например, «брюки – тоска»);
- в составе слова без прайма;
- в составе неслова с предшествующим ему замаскированным праймом;
- в составе неслова без прайма.

Каждая проба начиналась с предъявления фиксационного креста, за которым следовал пустой экран, двойная маска (ряд из восьми решёток – # и следом за ним ряд из восьми якорей – &), прайм или пустой экран,

сопровождавшийся маской, в зависимости от типа пробы. Затем на 75 мс предъявлялся целевой стимул. Завершалась проба предъявлением маски, после которой на экране появлялись две буквы, одну из которых испытуемому надо было выбрать в качестве ответа на вопрос, какая буква была предъявлена в центре целевого слова. Асинхрония предъявления прайма и слова, содержащего целевую букву, составляла 310 мс. В первом пилотажном эксперименте длительность предъявления стимулов-слов и неслов была подобрана таким образом, чтобы эффективность опознания буквы в неслове составляла 60–65% правильных ответов, как в экспериментах Д. Рейхера (Reicher, 1969). Однако результаты проведенного эксперимента показали, что в этом случае показатели опознания буквы в составе слова настолько высоки, что не допускают сопоставления между условиями. Вместе с тем, был получен высоко значимый ЭПС. По итогам анализа данных было принято решение о сокращении времени предъявления стимула, включающего целевую букву, до 60 мс. В предварительном эксперименте, в котором приняли участие 8 испытуемых, был также получен значимый ЭПС, а кроме того, тормозящее влияние предъявления прайма, ассоциативно связанного со словом, на эффективность опознания буквы в составе слова, что на уровне статистически незначимой тенденции наблюдалось и в первом пилотажном эксперименте. При этом само по себе наличие неосознаваемого прайма в пробе не оказывает значимого влияния на эффективность опознания буквы в составе как слова, так и неслова. На конференции планируется представить результаты исследования на расширенной выборке, которые позволят сделать более обоснованные выводы относительно семантического компонента ЭПС и нисходящих влияний на параметры этого эффекта. Полученные к настоящему моменту данные заставляют предположить, что активация значения слова за счет ассоциативно связанных с ним элементов ментального лексикона может оказывать влияние на эффективность опознания букв в составе слова.

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РАЗВИТИЕ ПРОЦЕССОВ ВНИМАНИЯ В МЛАДЕНЧЕСКОМ ВОЗРАСТЕ

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На ранних этапах когнитивного развития процессы организации и функционирования мозговых систем внимания занимают определяющие позиции. Сокращение сроков пренатального онтогенеза представляет собой значительный фактор риска для формирования когнитивных функций в последующие периоды развития. В качестве возможного механизма, определяющего будущие проблемы, могут выступать нарушения организации процессов внимания. В исследованиях последних лет была предложена нейropsychологическая модель трех взаимосвязанных систем внимания (Posner M.I., Petersen S.E., 1990;2001): 1) «система ориентировки или направления внимания» (posterior system); 2) «система бдительности» и 3) «система управления вниманием или исполнительного контроля» (anterior system). Поскольку в процессе онтогенетического развития формирование мозговых систем внимания происходит гетерохронно, то предполагается, что у преждевременно родившихся детей может выявляться парциальный дефицит отдельных систем внимания, что, возможно, связано с иными закономерностями формирования ЦНС у детей данной группы или/и влиянием различных эндо- и экзогенных факторов риска.

Методы исследования. Для изучения данной проблемы в работе использовали модель сравнения специфики развития процессов внимания у типично развивающихся детей и детей, относящихся к группе риска нарушений развития,— детей, родившихся на ранних сроках гестации (недоношенных детей). Исследование процессов внимания в младенческом и раннем возрасте включало в себя:

а) исследование «системы ориентировки» с использованием стандартного набора стимулов шкалы «Внимание» метода «Battelle Developmental Inventory» (Newborg J., et.al, 1984). Анализ проводили на основе

видеомониторинга и последующего кодирования временных микроинтервалов.

б) исследование «системы бдительности» с использованием метода оценки поддержанного или фокусированного внимания (“sustained attention”). Поведенческим коррелятом поддержанного внимания служила интенсивность мимического проявления эмоции интереса-возбуждения, проявляемая ребенком при манипулятивной деятельности с предметами (Lawson K.R., Ruff H.A., 2004). Анализ данных проводили с помощью метода Infant Affect Manual (Osofsky J., et.al., 1998).

в) исследование «системы управления вниманием» с использованием парадигмы отсроченного ответа в когнитивной «задаче A-not-B» (Diamond A., Goldman-Rakic P.S., 1985;1989). Данный вид задач оценивал способности ребенка к организации поведения, направленного на достижение цели и развитие системы исполнительного контроля действий. Максимальная длительность задержки при выполнении задачи A-not-B рассматривалась в качестве показателя рабочей памяти. Анализ данных проводили на основе материалов видеонаблюдения.

Результаты исследования. Сравнительный анализ частоты встречаемости фиксаций на предъявление различных типов стимулов шкалы «Внимания» метода Баттелл показал значимые различия между группами недоношенных и доношенных детей. Полученные данные свидетельствуют, что у недоношенных детей наблюдается парциальный дефицит «системы ориентировки внимания» по сравнению с доношенными сверстниками.

Результаты изучения «системы бдительности» позволяют заключить, что активное формирование процессов поддержанного внимания начинается в период от 3 до 6 мес., при этом в случае преждевременного рождения о данной функции можно говорить только во втором полугодии жизни и развивается она более медленными темпами.

Исследование «системы управления вниманием» проводили с использованием задачи-маркера на сформированность функций

рабочей памяти. Недоношенные дети были менее успешны в выполнении задачи A-not-B, т.е. проявляли ранний дефицит в возможностях регуляции своего поведения, основанного на выборе из двух хранящихся в памяти репрезентаций местоположения объекта, используя механизмы «управления вниманием». Можно предположить, что отставание в развитии функции рабочей памяти у недоношенных детей обусловлено более поздними сроками созревания префронтальных областей коры, являющихся нейрофизиологическим субстратом данных исполнительных функций.

Заключение. Результаты исследования свидетельствуют, что фактор сокращения пренатального периода онтогенеза обуславливает парциальный дефицит уровневых и динамических

характеристик мозговых систем внимания на ранних этапах развития.

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ВЫБОР СЛОВ ИЛИ КОНСТРУКЦИЙ? ДАННЫЕ ИЗ ОБЛАСТИ КОРПУСНОГО АНАЛИЗА ДВУЯЗЫЧНОЙ РЕЧИ

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Основная идея грамматики конструкций заключается в знаковости абстрактных схем предложений (Goldberg 2006). Данное убеждение основывается на том, что семантические и синтаксические свойства более крупных синтаксических единиц не выводимы напрямую из свойств составляющих их более мелких единиц, и что этими единицами кодируются различные ситуации (положение дел), в которых находятся говорящие (Goldberg 1995: 5). Похожие идеи можно встретить и в функциональной грамматике (для русского см. Мустайоки 2006). Этот подход отвергает исключительно лексическое управление порождением речи и ориентируется на большие единицы. На возможную когнитивную реальность таких единиц указывают также эксперименты с праймингом (Копорка, Бокс 2009).

Цель данного доклада заключается в том, чтобы ввести новый аспект в дискуссию, которая в литературе ведется между сторонниками лексического и конструкционного подходов речепорождения, и представить анализ билингвальной речи с точки зрения грамматики конструкций, а также с помощью методов корпусной лингвистики.

Если предположения конструкционной грамматики правильны, то конструкции являются неделимыми сложными знаками, которые

при произведении речи должны выбираться как одна целая единица.

В межязыковом сопоставлении конструкции могут в различной степени отличаться как по формальной характеристике, так и по значению. Вследствие этого двуязычный говорящий вынужден выбирать, средствами какого языка он будет выражать свой мыслительный замысел. На примере своей модели „Dual Language Model“ Кечкеш (2006, 2007) показал, как можно моделировать роль культурно-языковой специфичности лексикона для объяснения феномена переключения кодов. Выводя моделирование с уровня лексических концептов на уровень значения конструкций, данный доклад на примере корпусного анализа показывает, что конструкции, как пары формы и значения, действительно, можно растолковать как один из видов мотиваций для переключения кодов. Преимущество корпусного анализа заключается в том, что исследование не подпадает тем же ограничениям, которые, как известно, осложняют экспериментальное исследование порождения синтаксических единиц. Помимо того, при проведении анализа можно сосредоточиться на реальном употреблении языка.

С целью повышения видимости конструкций желательно рассматривать языковую пару с относительно большим типологическим расстоянием. В связи с этим данный анализ проводится на примере сербско-венгерских двуязычных. В ходе доклада будут представлены итоги

исследования, указывающие на то, что разница в инвентаре конструкций может быть причиной для перехода на другой язык, например, из-за отсутствия семантических средств, как в случае страдательного залога (который в венгерском языке отсутствует) или из-за редкости конструкций в одном из языков, как в случае каузатива (который в венгерском грамматикализован, а в сербском, напротив, очень редко употребляется). Кроме того, в докладе будет показано, что выбор одной конструкции влечет за собой морфологические ограничения, которые следуют формальной характеристике данной конструкции. Таким образом, конструкционный подход может включать в себя также концепцию «матричного языка» (Myers-Scotton 2002), избегая при этом его проблематичного определения, так как матрицей является не язык, а конструкция.

Исходя из вышесказанного, хотелось бы отметить, что сложным языковым единицам, описываемым в теории грамматики конструкций,

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ЦЕНТРАЛЬНЫЙ ИСПОЛНИТЕЛЬ РАБОЧЕЙ ПАМЯТИ: СВОЙСТВА И СТРАТЕГИИ ФУНКЦИОНИРОВАНИЯ

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От обоснования ответа на вопрос «Сколько памятей – одна или две?» когнитивные психологи перешли к изучению структуры отдельных компонентов памяти, в частности, кратковременной. Более адекватным был признан термин «рабочая память», отражающий функцию кратковременного хранилища – осуществление определенной работы, решение определенной задачи, в течение которой удерживается необходимая информация. А. Бэддели и Г. Хитч в 1974 выделили в рабочей памяти три компонента – центральный исполнитель, фонологическая петля и визуально-пространственный блокнот (Бэддели 2001). Позже, в 2000 году, Бэддели предложил расширенную модель рабочей памяти, где центральный исполнитель (ЦИ) взаимодействовал с визуально-пространственным блокнотом, полимодальным эпизодическим буфером и фонологической петлей, через которые осуществлялись направленные в обе стороны связи, соответственно, с образной семантикой, эпизодической долговременной памятью и языком. Предполагалось, что шахматная игра серьезно задействует центральный исполнитель рабочей памяти, который, в

соответствии с новой моделью, является системой внимания. Однако процессы центрального исполнителя и даже его свойства остаются не до конца выясненными.

Цель работы – выявление свойств и стратегий функционирования центрального исполнителя рабочей памяти как системы внимания.

Задача работы – разработка методики диагностики свойств внимания (на шахматной модели).

Существует точка зрения, что внимание является профессионально важным качеством шахматиста, а также определяет степень его готовности к соревнованию (Крогиус 1968). Однако, несмотря на подчеркивание значения изучения внимания и его свойств в шахматах, количественных методов диагностики внимания предложено не было.

Нами разработана специализированная методика изучения свойств внимания шахматиста (СМИСВ) и предприняты первые шаги по созданию ее компьютерной версии. При разработке методики учитывались данные о большей информативности специализированных тестов изучения внимания спортсменов и памяти шахматистов (Генов 1971; Барташников 1988). Теоретической основой послужили результаты анализа невербализованных компонентов мыслительной деятельности шахматиста, а именно,

выводы о важной роли исследовательских операций установления взаимодействий между фигурами (защита, нападение) (Тихомиров 1984). Методика аналогична корректурным пробам, но стимульным материалом служат диаграммы специально составленных шахматных позиций (10 позиций тренировочной серии и 40 – основной), в которых испытуемый должен находить, подчеркивать и подсчитывать атакованные фигуры и пешки (в каждой позиции их 10), делая это безошибочно и быстро (Васюкова 2011).

В процедуре поиска атакованных фигур в позиции проявляется внимание как направленность деятельности шахматиста на свой объект (взаимодействия между элементами шахматной позиции) и сосредоточенность на нем усилий для наилучшего выполнения этой деятельности. Схемы поиска атакованных фигур выступают стратегиями функционирования системы внимания.

Выделены показатели основной серии теста, которые мы интерпретировали как интенсивность, устойчивость, концентрация, переключение и распределение внимания, соответственно: время решения, соотношение среднего времени поиска 5 последних и 5 первых фигур в позиции, количество ошибок, среднее время поиска первой фигуры, среднее время поиска 10-й фигуры. Для уточнения трактовки данных показателей были проведены исследования, направленные на: а) установление связи выделенных показателей с разрядом, возрастом, результатами выступления шахматистов в соревновании, показателями других методик изучения свойств внимания и особенностей психофункционального состояния (4-х и 10 минутных корректурных проб, методика диагностики прогностической деятельности, цветовой тест Люшера); б) определение тенденций изменения данных показателей на различных этапах тренировочного процесса (начало и конец подготовки к соревнованию); в) поиск разрядных норм.

На выборке из 25 шахматистов от 2 разряда до международного мастера возраста от 10 до 33 лет выявлено, в частности, что время решения основной серии СМISB связано с распределением внимания по МДПД ($r=0.42$) и его интенсивностью по 4-х мин. КП ($r=-0.34$), т.е. уменьшение времени решения связано с улучшением распределения внимания, повышением его интенсивности. Ср. время поиска первой фигуры коррелирует с интенсивностью ($r=-0.52$) и переключением внимания ($r=-0.39$) по 4-х мин. КП: чем меньше время поиска первой фигуры, тем выше интенсивность и переключение внимания. Ср. время поиска 10-й фигуры

коррелирует с распределением внимания по МДПД ($r=0.47$), т.е. чем это время меньше, тем лучше распределение внимания между своими прогнозами и поступающей информацией.

Обнаружен неравномерный характер поиска атакованных фигур в позиции, в частности, значительное увеличение времени поиска 10-й фигуры.

Выявлены также различные стратегии поиска атакованных фигур в позициях, которые мы назвали эвристическими и алгоритмическими. Пример стратегии первого типа – поиск того, что сразу замечается. Примеры стратегии второго типа – поиск атакованных фигур слева направо; сначала поиск атакованных белых фигур и пешек, потом – черных, т.е. сначала поиск нападений со стороны черных, потом – со стороны белых; взятие за основу активных фигур, рассмотрение угроз (дальнобойные фигуры, кони). Эти стратегии можно соотнести, соответственно, с произвольным и произвольным внутренним контролем (по П. Я. Гальперину). Можно предположить, что алгоритмическая стратегия задействует большее число компонентов рабочей памяти, включая визуально-пространственный блокнот и фонологическую петлю, а эвристическая стратегия более экономна и опирается главным образом на эпизодическую память.

Итак, на материале шахматной игры, предположительно серьезно задействующей центральный исполнитель рабочей памяти, обнаружены важные свойства ЦИ как системы внимания, прежде всего это интенсивность, устойчивость, концентрация, а также распределение и переключение внимания. Три последних свойства отмечены А. Бэддели как процессы ЦИ. Интенсивностный аспект внимания нам представляется наиболее значимым, так как он ускоряет решение задачи, является главным критерием как профессионализма, так и готовности спортсмена к соревнованию (Васюкова 2011). Выявлены стратегии функционирования ЦИ, эвристическая и алгоритмическая, которые соотнесены с произвольным и произвольным внутренним контролем.

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КОГНИТИВНЫЕ ОСОБЕННОСТИ ЗДОРОВЫХ НОСИТЕЛЕЙ ГЕНОТИПА АРОЕ-4

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Генотип АРОЕ-4 связан со значительным повышением риска спонтанного развития деменции альцгеймеровского типа (ДАТ) в пожилом возрасте. Важным нерешенным вопросом при изучении связи между генотипом АРОЕ-4 и повышенным риском развития ДАТ остается определение точного характера когнитивных нарушений у здоровых носителей этого генотипа. Мета-аналитические обзоры выявляют тенденцию к снижению эффективности эпизодической памяти у здоровых носителей АРОЕ-4, однако в целом уровень когнитивного функционирования у них не отличается от нормального. Визуализация активности мозга показывает повышенный уровень активации префронтальных отделов коры у носителей АРОЕ-4, что может быть связано с компенсацией имеющихся у них когнитивных нарушений за счет мобилизации ресурсов когнитивного контроля (Величковский Б. М. и др., 2009).

Нами было проведено исследование, направленное на поиск нарушений в эпизодической памяти и когнитивном контроле у носителей генотипа АРОЕ-4 и на проверку предположения о компенсации возможных нарушений памяти за счет мобилизации ресурсов когнитивного контроля. В исследовании приняли участие 36 человек (8 мужчин и 28 женщин в возрасте от 24 до 68 лет). Из них 14 испытуемых являлись носителями генотипа АРОЕ-4 (определялся по присутствию минимум одного аллеля *e4* гена *ApoE*). Остальные испытуемые были отнесены к генотипу АРОЕ-3. Испытуемые были уравнены по среднему возрасту, уровню образования и наличию близкого родственника с болезнью Альцгеймера. Генотипирование локуса АРОЕ осуществлялось методом ПЦР-ПДРФ анализа. Было проведено клиническое и нейропсихологическое обследование, которое не выявило признаков деменции ни у одного испытуемого.

Батарея тестов включала в себя тесты на когнитивный контроль (тест на антисаккаду, тест на переключение задач, тест на обновление рабочей памяти – *n-back*), тест на определение «сложного» объема рабочей памяти (*operation span*), а также тесты на эффективность отсроченного воспроизведения и узнавания зрительного и вербального материала (шкала памяти теста Векслера и русскоязычный вариант теста *RVLT*, соответственно).

Испытуемые с генотипами АРОЕ-4 и АРОЕ-3 не различались по эффективности отсроченного воспроизведения, но различались по эффективности отсроченного узнавания – генотип АРОЕ-4 был связан с большим количеством «ложных тревог». Это позволяет характеризовать возможно имеющийся у носителей АРОЕ-4 дефицит эпизодической памяти как связанный с преимущественной опорой на автоматические процессы узнавания. Анализ связи между типом дистрактора (очень похожие / мало похожие на целевой стимул) и вероятностью возникновения «ложной тревоги» показал, что носители генотипа АРОЕ-4 значительно чаще ошибочно опознают «далекие» дистракторы, т.е. дистракторы, лишь слабо напоминающие целевые стимулы. Это позволяет сделать вывод о преобладании поверхностного кодирования запоминаемой информации у носителей АРОЕ-4.

Нами не было обнаружено свидетельств того, что у испытуемых с генотипом АРОЕ-4 имеются особенности в работе системы когнитивного контроля. Генотипы не различались по средним показателям эффективности выполнения теста на подавление автоматической саккады, на обновление рабочей памяти, а также в оценках объема рабочей памяти. Статистический анализ также не показал различий в общей эффективности выполнения теста на переключение между задачами, однако обнаружил значимое увеличение «стоимости переключения» у носителей генотипа АРОЕ-4. Следует отметить, что снижение эффективности переключения между задачами является характерным признаком непатологического когнитивного старения (Kray, Li & Lindenberger, 2002).

С целью выявления возможной компенсации нарушений эпизодической памяти у носителей

АРОЕ-4 за счет активности системы когнитивного контроля, для обеих групп испытуемых были выделены композитные показатели эффективности когнитивного контроля и эпизодической памяти и рассчитана корреляция между ними («лобный эффект», Glisky & Kong, 2008). В группе носителей АРОЕ-3 индексы значительно не коррелировали. Тенденция к значимой положительной корреляции между композитными индексами была обнаружена в группе носителей генотипа АРОЕ-4. Следовательно, у носителей генотипа АРОЕ-4 эффективность выполнения тестов на эпизодическую память в большей степени связана с эффективностью функционирования системы когнитивного контроля. Кроме того, для носителей АРОЕ-4 было зафиксировано значимое снижение эффективности выполнения всех тестов на когнитивный контроль к концу выполнения каждого теста. Этот эффект может говорить о повышенной истощаемости ресурсов когнитивного контроля у носителей этого генотипа. Полученные результаты служат косвенным свидетельством повышенной мобилизации ресурсов когнитивного контроля у носителей генотипа АРОЕ-4.

Таким образом, для здоровых носителей генотипа АРОЕ-4 характерны специфические нарушения эпизодической памяти (опора на автоматические процессы узнавания, поверхностное кодирование стимулов), а также специфическое

снижение эффективности переключения между задачами. Эти показатели могут быть использованы при построении прогностических моделей риска развития ДАТ у здоровых носителей генотипа АРОЕ-4. Кроме того, полученные свидетельства возможной компенсации имеющихся у здоровых носителей генотипа АРОЕ-4 когнитивных дефицитов за счет мобилизации ресурсов когнитивного контроля говорят о необходимости контролировать данное компенсаторное влияние при проведении дальнейших исследований когнитивных нарушений в этой популяции. В целом может быть сделан вывод о том, что повышение риска развития ДАТ у носителей генотипа АРОЕ-4 обусловлено сочетанием патологических и непатологических процессов когнитивного старения.

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СРАВНЕНИЕ МЕТОДОВ ИЗУЧЕНИЯ ЭМОЦИОНАЛЬНОГО ИНТЕЛЛЕКТА

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Эмоциональный интеллект – быстро расширяющаяся область исследований, объединяющая разнообразные научные дисциплины. Понятие эмоционального интеллекта, возникшее в начале 1990-х годов, получило со временем более четкое определение и стало вызывать растущий интерес, как со стороны популярных СМИ, так и в научных кругах. Точкой демаркации в возникновении систематических исследований ЭИ считается статья Дж. Мэйера и П. Сэловея в журнале «Интеллект» (Mayer, Salovey, 1993). Чуть позже термин «эмоциональный интеллект» был популяризован психологом и журналистом Д. Гоулменом (Goleman, 1995) в его книге, основанной на статьях и научной работе многих других ученых.

На данный момент существует 2 основных подхода к проблеме эмоционального интеллекта: модель эмоционального интеллекта как способности и смешанные модели. Теория Дж. Мэйера и П. Сэловея эмоционального интеллекта как способности основана на нескольких ключевых идеях. Из области исследований интеллекта взято представление о том, что интеллект включает в себя, прежде всего, способность к абстрактному рассуждению. Из области исследований эмоций взята идея о том, что эмоции – это сигналы, которые передают привычные и легко распознаваемые значения в сфере взаимоотношений. Идея о том, что, по крайней мере, некоторые основные эмоции универсальны, основывается, помимо прочего, на обширных исследованиях основных выражений эмоций на лицах у людей и представителей родственных им видов (Ekman, 1973) и экспериментальных исследованиях искусственного интеллекта,

которые показывают, что понимание эмоций компьютером возможно (например, Dyer, 1983). Смешанные модели эмоционального интеллекта опираются на широкое определение этого конструкта, данное Гоулменом (Goleman, 1995). То есть интерпретируют его как сложное психическое образование, имеющее и когнитивную, и личностную природу. В эти модели включаются когнитивные, личностные и мотивационные черты, благодаря чему они оказываются близко связанными с адаптацией к реальной жизни (например, Bar-On, 1997, Epstein, 1998). Все модели в этом подходе отличаются только набором включенных личностных характеристик.

В рамках модели эмоционального интеллекта как способности единственным возможным средством измерения эмоционального интеллекта являются тесты. В противоположность опросникам, тесты эмоционального интеллекта обладают неплохой критериальной валидностью и измеряют некие конструкты, отличные от всех уже выделенных в психологии способностей и личностных факторов (Робертс и др., 2006). Тем не менее, пока остается неясным, как эмоциональный интеллект соотносится с уже выделенными конструктами. Также большой вопрос вызывает подсчет баллов, так как в подавляющем большинстве методик он основан на консенсусе и оценках экспертов, что не исключает конформность к социальным нормам. Не меньший интерес вызывает соотношение тестовых и опросниковых методик для изучения эмоционального интеллекта – измеряют они какой-то единый конструкт или существуют несколько «эмоциональных интеллектов»?

Наиболее известным и широко используемым тестом эмоционального интеллекта на данный момент является методика MSCEIT V2.0 (The Mayer–Salovey–Caruso Emotional Intelligence Test) (Mayer, Salovey, Caruso, 2002). Она обладает хорошими психометрическими показателями и активно используется в различных западных исследованиях. Н. Шуте с коллегами, опираясь на раннюю модель эмоционального интеллекта Дж. Мэйера и П. Сэловея (Shutte et al., 1998), создал опросник Self Report Emotional Intelligence Test (SREIT), который позволяет оценить 3 составляющие эмоционального интеллекта: Оценку и выражение эмоций, Регуляцию эмоций и Использование эмоций в решении проблем. Результаты по внутренней и ретестовой надежности единой шкалы из 33 пунктов были признаны удовлетворительными: $n=127$, $\alpha=0,9$; $n=128$, $r=0,78$ (Schutte et al., 1998). Была предпринята попытка соотнести данные, полученные с помощью этих двух методик

(Ciarrochi, Deane, Anderson, 2002), на выборке из 302 австралийских студентов, которая показала полное отсутствие значимых взаимосвязей между показателями MSCEIT и SREIT.

На этапе проверки психометрических показателей методики SREIT для русскоязычной выборки мы провели аналогичное сравнение. К этому времени методика MSEIT была уже переведена и показала неплохие психометрические результаты на русскоязычной выборке (Сергиенко, Ветрова, 2010).

На выборке из 57 человек в возрасте от 18 до 26 лет (27 юношей и 30 девушек) между MSCEIT и SREIT было выявлено всего 2 значимые связи: шкала SREIT «Регулирование эмоций» связана со шкалой MSCEIT «Сознательное управление эмоциями», а шкала SREIT «Оценка и выражение эмоций» имеет связь с «Использованием эмоций в решении проблем» MSCEIT. С одной стороны, при схожести теоретических оснований можно отметить различия по принципу построения методики – является она опросником или тестом. Однако в аналогичном исследовании австралийских коллег вообще не было выявлено связей. Вероятно, тут свою роль сыграла численность исследуемых групп и особенности перевода данных методик на русский язык.

Тем не менее, хотелось бы выдвинуть и предположение о групповых различиях между англоязычными и русскоязычными испытуемыми. Русские люди более склонны к саморефлексии, более глубокому осмыслению и анализу эмоций, как своих, так и чужих. В таком случае вполне закономерно, что представления о собственном эмоциональном интеллекте именно у русских больше соответствуют действительности и объективным данным, полученным с помощью теста. Таким образом, получает некоторое подкрепление идея о создании методики на эмоциональный интеллект, включающей в себя как тестовые, так и опросниковые задания, для изучения более обобщенного и широкого конструкта. Создание именно такой методики предполагается в рамках изучения эмоционального интеллекта у подростков. Основной задачей создания методик на эмоциональный интеллект была практическая необходимость измерения эмоционального интеллекта для профессионального отбора, прогнозирования успешности в различных делах, связанных с эмоциями и т.п. Тем не менее, эмоциональный интеллект является психологическим конструктом, изучение которого необходимо развивать в теоретической науке, сопоставлять с другими различными психологическими конструктами и способностями для получения более широких

представлений как о нем самом, так и о связанных с ним конструктах.

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КОНТРОЛЬ ПОВЕДЕНИЯ И ЕГО СТРАТЕГИИ В РАННЕМ ВОЗРАСТЕ

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При изучении саморегуляции поведения человека, особенно ее ранних этапов, большой интерес вызывает идея интегративной оценки возможностей ребенка по адаптации к окружению, организации целенаправленного поведения и своеобразию индивидуальных типов такого адаптивного поведения. В цикле исследований, выполненных в лаборатории психологии развития ИП РАН, эта идея реализуется при изучении такого конструкта, как контроль поведения. Контроль поведения включает регуляцию психических процессов, обеспечивающую целенаправленную деятельность. Он опирается на ресурсы индивидуальности, отражая способ и степень эффективности их реализации, представляя собой уникальную композицию ресурсов и индивидуально-специфичный способ обращения с ними (Сергиенко, 2006, 2009, Сергиенко и др., 2010).

В контроле поведения выделяются три компонента: контроль действий – уровень моторного исполнения; когнитивный контроль – способность к когнитивному анализу, предвосхищению и планированию деятельности; эмоциональный контроль – способы регуляции эмоциональных состояний, распознавание, интерпретация и прогнозирование собственных эмоций и эмоций Другого.

Особый интерес для нас представляют ранние этапы онтогенеза контроля поведения, т.к. именно тогда складываются индивидуально-специфичные способы реагирования, формируются те ресурсы, на которые в дальнейшем будет опираться контроль поведения.

В исследовании принимали участие одиночно рожденные дети (ОР) (46 чел.) и близнецы, монозиготные (МЗ) (12 пар) и дизиготные (ДЗ) (12 пар), обследованные лонгитудно в возрасте 4, 8, 12, 18, 24, 30 и 36 мес. Близнецы в данном случае выступают как группа биологического и психологического риска (здесь изложена лишь часть результатов более обширного исследования, включавшего и оценку генотип-средового вклада в различные аспекты раннего развития). Для оценки контроля действий и когнитивного

контроля использовался тест «Шкалы развития младенцев Бейли» («Шкалы развития младенцев Бейли»-2 (Bayley, 1993)). В тесте Бейли нами были выделены отдельные субшкалы с целью более глубокого изучения указанных компонентов контроля поведения. В ментальной шкале это субшкалы интерсенсорных взаимодействий, речевого поведения, экстраполяции, контроля, кооперации, общих категорий. В психомоторной шкале – субшкалы контроля позы, локомоций, манипуляций (тонкой моторики).

Изучение контроля поведения в проблемных ситуациях проводилось при помощи программно-аппаратного комплекса INTERACT, оценивались стратегии поведения ребенка в ситуации оценки его когнитивных возможностей (тест Бейли), были отобраны задания, требующие контроля поведения (включающие планирование, действие по образцу, по плану, преодоление препятствий, задания, сложные для данного возраста и т.д.). Выделялись следующие стратегии: сосредоточение на задаче, переключение внимания, вокализации, поиск поддержки, самостимуляция, агрессия, двигательное беспокойство, отказ от выполнения задания, дистресс, пассивность.

Далее анализировались взаимосвязи между когнитивным контролем, контролем действий и выбираемыми детьми ситуативными стратегиями контроля поведения (эмоциональный контроль в данной работе не рассматривается).

При рассмотрении возрастной динамики наибольшее количество связей между стратегиями и субшкалами ментальной и психомоторной шкалы у ОР детей было обнаружено в 18 мес. В основном, это отрицательные связи с такими дезадаптивными стратегиями, как агрессия и отказ от выполнения задания. Это служит еще одним доказательством кризисного характера данного возраста у ОР детей (Сергиенко и др., 2010), где проявляется его деструктивная сторона. Недостаточные возможности регуляции, проявляющиеся в дезадаптивном поведении, приводят к деструкции деятельности и ухудшению результатов по отдельным субшкалам. Это относится, в первую очередь, к субшкале интерсенсорных взаимодействий и субшкале контроля действий. В последующих возрастах количество взаимосвязей между субшкалами и

стратегиями снижается, что может говорить о большей вариативности поведения детей и возможности достигать результата разными путями с использованием различных стратегий (отметим также уменьшение частоты дезадаптивных стратегий с возрастом).

У ОР детей наибольшее число связей субшкал ментальной и психомоторной шкалы наблюдается со стратегией вокализации, что показывает важность речевого развития и общения для когнитивного и психомоторного развития. Символическая репрезентация и язык – это средства, которыми ребенок связывает настоящее с прошлым опытом и будущей целью, поэтому речь играет одну из ключевых ролей в развитии когнитивного контроля.

Следует учитывать также, что дети-экстраверты могут получить более высокие баллы по тестам развития и интеллекта, поскольку охотнее взаимодействуют с экспериментатором, производя на него более благоприятное впечатление (Матени-мл., 1994). Можно предположить, что этот эффект срабатывает и в случае с детьми, активно использующими стратегии вокализации.

У близнецов как МЗ, так и ДЗ, связей между стратегиями и субшкалами ментальной и психомоторной шкалы больше, чем у ОР детей (на данном этапе исследования пока неясно, за счет чего это происходит). Помимо этого, у близнецов наблюдается общая тенденция – большое количество отрицательных связей между субшкалами ментальной и психомоторной шкалы и частотой изменения настроения во время тестирования (с 12 мес.), что говорит о значительной связи низкого эмоционального контроля (выражающегося в эмоциональной лабильности) с контролем действий и когнитивным контролем, вплоть до блокирования деятельности эмоциями. У ДЗ близнецов таких связей меньше,

чем у МЗ, что говорит, видимо, об их большей способности справляться с эмоциональной нестабильностью.

У МЗ близнецов связи стратегий с контролем действий и с когнитивным контролем в каждом возрасте разнообразны и какой-либо закономерности выявить на данном этапе анализа не удалось. У ДЗ близнецов отмечаются связи когнитивного контроля и контроля действий со стратегией самостимуляции, которую можно рассматривать как специфичную для ДЗ близнецов “стратегию совладания”, которая, к тому же меняет свою роль в системе регуляции поведения с возрастом. Если в 1-й год жизни самостимуляция была отрицательно связана с субшкалами ментальной и психомоторной шкал (контроль позы, локомоция, экстраполяция), то, начиная с 30 мес., она уже положительно связана как с контролем действия в целом, так и с интерсенсорными взаимодействиями, умением выделять общие категории. Если в первые 2 года самостимуляция тормозила когнитивное и психомоторное развитие, возможно, способствуя “отгораживанию” от окружающего мира, то на 3-м году жизни она уже выполняет функцию регуляции состояния, помогая справиться с чрезмерными эмоциональными, когнитивными или сенсорными нагрузками, что свидетельствует об изменении ее функциональной роли в структуре саморегуляции.

В целом, можно отметить специфические для каждой группы детей структуры связей между когнитивным контролем, контролем действий и ситуативными стратегиями контроля поведения, что подтверждает положение о контроле действий как основе индивидуальной адаптации, индивидуально-специфичном способе организации ресурсов для осуществления саморегуляции.

ОБРАЗ КАК НЕПОДВИЖНАЯ ТОЧКА ПРЕДВОСХИЩЕНИЙ

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В работе Смирнова С. Д. 1985 восприятие описано следующим образом: предсказание (антиципация) непрерывно во времени сравнивает «образ» («образ мира») с наличной стимуляцией и является процессом активного движения от «образа» к внешнему миру – непрерывным во

времени процессом проверки предсказаний «образа» на соответствие стимулам внешнего мира. Только если все предсказания будут совпадать с реальными стимулами непрерывно во времени, только тогда есть восприятие. «Все это позволяет нарисовать следующую картину хода познавательной деятельности на уровне восприятия. Индивид всегда имеет некоторый образ или модель окружения, которая непрерывна во времени и пространстве и носит прогностический характер, т. е. в ней экстраполируются и воспроизводятся на языке чувственных модальностей

ожидаемые результаты воздействия источника стимула на наши органы чувств».

Насколько известно автору, в настоящее время нет формализаций восприятия, как такого непрерывного во времени процесса предвосхищения стимулов и проверки этих предвосхищений на соответствие стимулам внешнего мира. Целью данной работы является разработка такой формализации.

Под предвосхищением будем понимать предсказание, а под моделью окружения или «образом мира» – совокупность закономерностей $P_1 \& \dots \& P_k \& A \Rightarrow P$, предсказывающих, что, если сейчас мы воспринимаем признаки $P_1 \& \dots \& P_k$ (стимулы) и осуществили перцептивное действие A , то в следующий момент времени мы воспримем признак P_0 . Предположим, что объекты восприятия характеризуются признаками x_1, \dots, x_n . Каждый признак x_i может принимать на объекте a некоторое множество значений ($x_i(a) \in X_i$). Тогда воспринимаемый объект a может быть описан набором множеств значений воспринимаемых признаков $\langle X_{i_1}(a), \dots, X_{i_m}(a) \rangle$. Для каждого значения признака определим предикат $P_j^i(a) \Leftrightarrow (x_i(a) = j), j \in X_i(a)$. Будем предполагать, что в закономерности $P_1 \& \dots \& P_k \& A \Rightarrow P_0$ все предикаты имеют вид $P_j^i(a)$. Действие A состоит в переводе внимания с воспринимаемых в текущий момент стимулов $P_1 \& \dots \& P_k$ на стимул P_0 , который будет воспринят в следующий момент. Множество PL закономерностей «образа мира» может быть обнаружено методом, изложенном в Витяев 2006. Закономерность «извлекается из памяти» при восприятии объекта a , если она применима к объекту и её посылка $P_1 \& \dots \& P_k$ выполнена на a . Тогда осуществляется предвосхищение восприятия P_0 в следующий момент. Если предвосхищение подтвердилось – мы видим нужное значение признака,

зафиксированное в P_0 , то восприятие продолжается, и мы переходим к следующей «извлечённой из памяти» закономерности. Если не подтвердилось, то внимание уточняет признаки воспринимаемого объекта и закономерность.

Восприятие объекта a – это непрерывное во времени предсказание одних свойств объекта по другим посредством *всех* применимых к объекту («извлечённых из памяти») закономерностей и проверка правильности сделанных предсказаний. Формализацией такого процесса восприятия является неподвижная точка предсказаний по всем «извлечённым из памяти» закономерностям. Определим, оператор предсказания Pr , применённый к воспринятому объекту a , $X(a) = \{X_{i_1}(a) \cup \dots \cup X_{i_m}(a)\}$ и осуществляющий предсказания по всем «извлечённым из памяти» закономерностям $LP(X(a))$: $LP(X(a)) = \{P_{j_1}^{i_1} \& \dots \& P_{j_k}^{i_k} \Rightarrow P_{j_0}^{i_0} \in LP \mid (x_{j_1}^{i_1} \in X_{i_1}(a)) \& \dots \& (x_{j_k}^{i_k} \in X_{i_k}(a))\}$; $Pr(X(a)) = X(a) \cup \{x_{j_0}^{i_0} \mid (P_{j_1}^{i_1} \& \dots \& P_{j_k}^{i_k} \Rightarrow P_{j_0}^{i_0}) \in LP(X(a)), (x_{j_0}^{i_0} \in X_{i_0}(a))\}$.

Тогда восприятие объекта a завершено успешно, если мы имеем неподвижную точку оператора Pr , т.е. когда $Pr(X(a)) = X(a)$.

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24

На основе данной формализации образа нами разработана программа, работа которой иллюстрируется на примере закодированных цифр (рис. 1 слева). В эксперименте обучающее множество цифр состояло из всех цифр рис. 1,

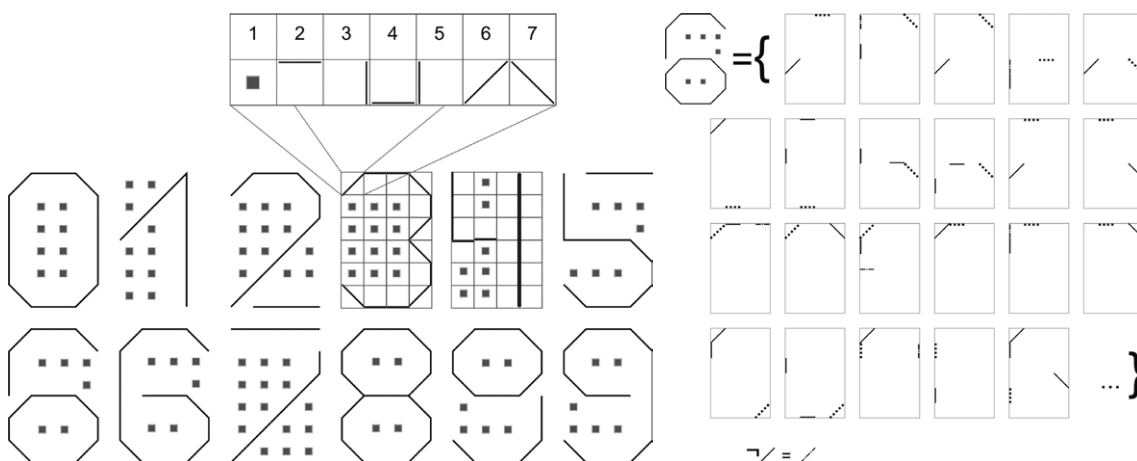


Рисунок 1.

каждая из которых бралась в 30 экземплярах. В обучающем множестве не указывалось, где какая цифра. Задача самообучения без учителя состояла в том, чтобы найти все образы цифр как неподвижные точки и убедиться, что они образуют в точности все классы-образы, соответствующие нашим 12 цифрам. Программой было обнаружено 55089 закономерностей, и эти закономерности дали в точности 12 неподвижных точек, соответствующие цифрам рис. 1. В качестве примера рассмотрим неподвижную точку цифры 6 (рис. 1 справа). Здесь представлены некоторые закономерности цифры 6, взаимно предсказывающие свойства этой цифры и составляющие неподвижную точку. Первая закономерность (первый прямоугольник после фигурной скобки) означает, что, если в квадрате 13 стоит признак 6 (обозначим это как $13-6$), то в квадрате 3 должен стоять признак 2 ($3-2$), который нарисован пунктирной линией, как предсказываемый признак. Тогда первую

закономерность, описывающую цифру 6, можно записать как $(13-6 \Rightarrow 3-2)$. Нетрудно проверить по цифрам, что эта закономерность действительно имеет место. Вторая закономерность говорит, что из признака $(9-5)$ и отрицания (обозначенного пунктирной линией) значения 5 первого признака $\neg(1-5)$, следует $(4-7)$. Получим закономерность $(9-5 \& \neg(1-5) \Rightarrow 4-7)$. Последующие 3 закономерности будут соответствовать закономерности $(13-6 \Rightarrow 4-7)$, $(17-5 \& \neg(13-5) \Rightarrow 4-7)$, $(13-6 \Rightarrow 16-7)$. На рисунке видно, что признаки цифры 6 взаимно предсказывают друг друга, образуя неподвижную точку.

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РОЛЬ ЗНАКА И ЕГО СЕМАНТИКИ ПРИ ФОРМИРОВАНИИ ПОНЯТИЙ

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В настоящее время показано, что понятия с определенной структурой могут образовываться без знака (Posner & Keele, 1970). Однако существует также несколько работ, в которых показано, что формирование понятий существенно улучшается, если объекты категоризации сопровождаются знаками или словами. В нашем исследовании нас интересует, могут ли влиять на формирование понятия знак и его значение, отдельно друг от друга, и если да, то кто из них имеет большее влияние?

Чтобы сравнить влияние знака на формирование понятий с влиянием его значения, нужно создать условия, в которых значение присутствовало бы в формировании понятия, но не было бы связано с функцией обратной связи. Для этого мы решили воспользоваться методикой индуцирования ложных воспоминаний, впервые осуществленной в парадигме Deese/Roediger-McDermott – DRM-test (Roediger & McDermott, 1995).

Мы предположили, что если мы создадим у испытуемых ложное воспоминание о

конкретном слове, значение которого будет связано с объектами для формирования понятия, то мы сможем оценить, насколько само значение без знака помогает формировать понятие. Для оценки влияния значения без влияния других факторов нам нужно будет сравнить это условие формирования понятия с условиями, когда нет ни знака, ни значения, и условием, когда есть знак с его значением.

Наши экспериментальные гипотезы таковы, что если и значение, и сам знак помогают формировать понятие, то в условиях со знаком и значением и в условиях со значением и без знака испытуемые должны быть более успешны в формировании понятия, чем в условиях без знака и без значения. Время реакции также должно быть выше в тех двух условиях, в которых используются знак со значением и значение без знака, поскольку они опосредуют процесс категоризации и тем самым должны удлинять время на принятие решения.

Мы использовали процедуру, аналогичную DRM-тесту, для выбора слова, дающего самые сильные оценки ложных воспоминаний. Это слово (*стул*) мы использовали в основной экспериментальной серии для формирования понятия.

Материал для индукции значения с помощью ложных воспоминаний. Мы индуцировали значение слова *стул* с помощью десяти слов, имеющих максимальную частотность при свободном

ассоциировании (испытуемые должны были запомнить список из 10 слов, ассоциирующихся со словом *стул*, причем само это слово им не называлось, а через некоторое время выполнить задание на узнавание. В списке на узнавание среди предъявленных ранее ассоциаций было и само слово *стул*, которое ложно узнавалось испытуемыми).

Материал для формирования категории. Мы создали объекты для категоризации, модифицируя трехмерную модель стула по четырем измерениям: высота спинки, длина ножек, ширина и глубина сиденья. Каждое измерение мы увеличивали на восемь значений, так что первые четыре значения позволяли включить объект в категорию, а последние четыре – нет. Таким образом, у нас было 32 объекта для категоризации (половина использовалась в тренировочной серии, а половина – в тестовой). В тренировочной серии испытуемые получали весь набор объектов три раза в разном порядке внутри блока. В тесте они получали набор объектов два раза также в случайном порядке.

Задачей испытуемых было научиться отличать *стулья* от *нестульев*. Объекты предъявлялись на мониторе на 500 мс, время на ответ – максимум 3 секунды. Порядок предъявления проб был случайным.

Испытуемые попадали в случайном порядке в одно из трех экспериментальных условий. Во всех трех условиях их предупреждали, что они получат группу изображений одного стула, измененных таким образом, что на некоторых из них стул выглядит привычно, а на некоторых нет.

В первом контрольном условии (без знака и без значения) испытуемые сразу после ответа получали обратную связь через наушники в виде звука – раздавался звуковой сигнал, если они правильно относили объект к одной из двух категорий. Если же они отвечали неправильно, то звука не было.

Во втором контрольном условии (со знаком и со значением) мы после звуковой обратной связи показывали на экране слово «стул» (длительность его предъявления составила 500 мс) в тех пробах, которые относились к этой категории. В тех пробах, которые относились к другой категории, показа не было.

Третье условие, экспериментальное (со значением и без знака), было идентично первому контрольному условию. Однако испытуемые получали перед задачей на категоризацию

задачу на запоминание, с помощью которой мы индуцировали у них нужное значение. Сразу после категоризации мы оценивали силу ложных воспоминаний.

Во всех трех условиях зависимой переменной была успешность категоризации и время реакции.

Мы сравнили успешность научения в тренировочной и тестовой сериях во всех условиях эксперимента с помощью дисперсионного анализа (ANOVA) с повторными измерениями. Успешность в трех группах к концу научения значимо увеличивалась, $F(2, 106) = 4,73$; $p = 0,01$; $\eta_p^2 = 0,08$. Испытуемые во всех экспериментальных группах сформировали обобщение, однако по уровню успешности различий между ними не было, что не подтверждает нашу гипотезу.

Однако для времени реакции были получены другие результаты. Помимо того, что оно значимо уменьшалось во всех группах от первого периода научения к третьему ($F(2, 106) = 29,35$; $p < 0,001$; $\eta_p^2 = 0,36$), что свидетельствует об эффекте тренировки, время реакции в экспериментальных группах, в отличие от успешности, значимо отличалось $F(2, 53) = 5,16$; $p < 0,01$; $\eta_p^2 = 0,16$. Быстрее всего на всех периодах обучения отвечали испытуемые в контрольном условии без знака, медленнее всех – в контрольных условиях со знаком. Таким образом, время реакции при формировании категории зависело от наличия знака и не зависело от наличия значения – знак, а не значение опосредовал процесс категоризации и испытуемые тратили часть времени, используя его. Тем самым мы приходим к выводу, что знак имеет большее влияние на формирование понятия, чем его значение.

Однако косвенные результаты свидетельствуют о том, что индуцированное значение все же участвовало в формировании понятий – интенсивность ложных воспоминаний значительно увеличилась после этой процедуры. Т.е. значение индуцированных слов не влияет на формирование понятий, но само формирование понятий актуализирует эти значения и усиливает, в свою очередь, ложные воспоминания.

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ВИРТУАЛЬНАЯ РЕАЛЬНОСТЬ: ИНТЕРПРЕТАЦИИ

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Термин «виртуальная реальность» (ВР) допускает множественное толкование. В общественном сознании с ним связаны следующие интерпретации (Voiskounsky 2011):

1. ВР связана с деятельностью, осуществляемой в пространстве Интернета: игрой онлайн, перепиской в социальных сетях, блоггерством, поиском информации и т.п. Данная интерпретация распространена в массовой культуре, в СМИ.

2. ВР понимается как альтернативная реальность, в ней можно «путешествовать», особенно с помощью психопрактик «расширения» сознания; постмодернистское представление о множественности (полионтичности) и иерархии реальностей включает убеждение, что все они виртуальны (Носов 2001, Руднев 2011).

3. Компьютерная интерпретация: ВР – интерактивная модель среды, создана с помощью компьютера и специальных программ и представлена органам чувств посредством шлема

или стереочков, иногда и перчаток (Игнатъев и др. 2009).

Цель работы состоит в выяснении того, какая интерпретация понятия виртуальных реальностей наиболее близка молодым образованным россиянам, не занимающимся ВР профессионально. Замысел состоял в определении возможных изменений в понимании ВР, вызванных показом кинофильма «Аватар» между 1-м и 2-м этапами исследования.

В исследовании, проведенном методом интервью, участвовали студенты МГУ естественных (биологи, математики, химики, геологи) и гуманитарных (журналисты, историки, юристы) факультетов. Предварительная серия показала, что студенты (кроме одного) не готовы сформулировать свое представление о ВР, но им знакомы примеры ВР. В основной серии (из 2-х этапов, оба этапа идентичны по процедуре) респондентов просили привести столько примеров ВР, сколько сумеют; назвавшего пример респондента просили продолжить; после второго отказа респондента побуждение прекращалось. Этап 1 основной серии был проведен весной, этап 2 – осенью 2010 г.

	Весна 2010		Осень 2010	
Примеры виртуальной реальности	Пол (ж / м)	Специализация (Гум. / Ест.)	Пол (ж / м)	Специализация (Гум. / Ест.)
Социальные сети	18/11	19/10	14/11	15/10
Рольевые игры	7/14	9/12	9/16	7/18
Твиттер	5/8	8/5	2/6	6/2
Чаты	4/7	9/2		
Онлайн-магазины	4/3	2/5		
Моментальные сообщения	3/4	6/1	1/2	1/2
YouTube	4/1	4/1	4/0	3/1
Электронная почта	2/3	5/0	2/1	1/2
Поиск в WWW	4/0	1/3		
3D	1/3	0/4	0/3	2/1
Блоги	0/3	2/1	6/6	7/5
Web Money	0/3	0/3	4/7	8/3
Спецэффекты в кино	2/1	3/0	5/6	10/1
WWW	2/0	2/0		
Телевидение	1/1	2/0	2/1	2/1
Онлайн-аукционы	0/2	0/2		
Игровая приставка Nintendo	0/1	0/1		
Кинофильмы	1/0	0/1	0/1	0/1
Электронные газеты	1/0	1/0	0/1	0/1
Аватары			10/14	9/15
Ipad			7/9	5/11
3D монитор			1/3	0/4
3D очки			1/1	2/0
iPhone 4			0/1	0/1
Расширенная реальность			1/0	1/0

Таблица 1. Примеры ВР, названные на 1-м и на 2-м этапе, расклассифицированные по полу и по учебной специализации студентов

На этапе 1 были проинтервьюированы 42 респондента (средний возраст 19.8 лет), на этапе 2–48 респондентов, средний возраст 20.4 лет. Половой состав респондентов и их специализация (естественные / гуманитарные науки) указаны в Табл. 1. Названные примеры записывались на диктофон и впоследствии классифицировались автором и двумя ассистентами; результаты классифицирования помещены в Табл. 1. Количество называемых респондентами примеров варьировало от 2 до 8 на 1-м этапе и от 2 до 6 на 2-м этапе, среднее число называемых примеров ВР несколько превышает 3.

Обращают на себя внимание три момента. Во-первых, анализ представленных в Табл. 1 результатов показывает, что потенциальные характеристики, присущие второму типу интерпретации, не были названы респондентами. Таким образом, литературные, религиозные и философские составляющие т.н. «эффекта присутствия», как и эффектов измененных состояний сознания, никак не связываются респондентами с разновидностями ВР.

Во-вторых, почти все названные респондентами примеры относятся к первому типу ВР, т.е. они относятся к выполняемым в пространстве Интернета действиям. Это особенно характерно для 1 этапа: лишь ответы «3D» (названы 4 раза) и, возможно, «спецэффекты в кино» (названы 3 раза) могут быть отнесены к компьютерному типу ВР. Среди названных примеров количественно превалирует участие в социальных

сетях и в ролевых играх: респонденты, видимо, опираются на свой опыт и опыт своих знакомых.

В-третьих, отметим сдвиг в сторону третьего типа интерпретации на 2 этапе, характерный и для девушек, и для юношей: появились ранее отсутствовавшие примеры, связанные компьютерными ВР: 3D мониторы и 3D очки, расширенные реальности, а также аватары (названы 24 раза) – хотя последние характерны и для 1-го, и для 3-го типа ВР, тем не менее аватары названы исключительно на 2 этапе. На 2 этапе названы также iPhone 4 (1 раз) и iPad (16 раз), что вызвано рекламой данных продуктов.

Определенный сдвиг в сторону компьютерной интерпретации ВР на 2-м этапе можно объяснить знакомством респондентов с к/ф «Аватар». Таким образом, на характер научных знаний о виртуальной реальности заметно влияет массовая культура. Работу по применению компьютерных ВР в шоу-бизнесе и в музейных экспозициях, как и попытки создания систем расширенной реальности бытового применения, следует считать оправданными.

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РАЗВИТИЕ ПОНЯТИЙ ХИМИИ: ИСТОРИЧЕСКИЙ И ПСИХОЛОГИЧЕСКИЙ АСПЕКТЫ

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Чтобы понять работу ума, необходимо анализировать отношения субъективного опыта человека и культуры, их структуру и динамику (Aleksanlrov, Aleksanlrova; 2007). Между развитием концептуальных структур химии в индивидуальном опыте субъекта и историко-культурным развитием предметного содержания химии имеется аналогия, оно происходит как переход от состояний глобальных и мало дифференцированных к состояниям все большей дифференцированности и иерархической связности (Чуприкова; 2007).

Историко-культурный анализ развития предметного содержания химии позволил

воспроизвести зафиксированную и опредмеченную в культуре химическую картину мира, раскрыть процесс формирования химических концептов.

В античном периоде развития химии можно обнаружить прообразы ключевых понятий, составляющие каркас современной науки, – элемент, атом, связь, соединение (миксис), химическое явление, специфика химического взаимодействия (пропорциональность), строение. Высказаны основные идеи, необходимые для определения понятия «элемент», – «атом», характеристика атома (вес, размер, форма), ограниченность числа форм атомов. То есть элемент – это совокупность атомов определенного вида. Но поскольку понятие «элемент» не было отделено от понятия «тело», «вещество», «агрегатное состояние», операционализация этого

ключевого понятия химии затянулось на века – пока шло освобождение объективной химической картины мира от субъективных воззрений ученых разных эпох. Только тогда появилась возможность интеграции этих понятий, возможность операционализации понятия «элемент».

Анализируя учение о химическом строении вещества, следует отметить, что впервые идею геометрической структуры разных видов материи можно найти у Платона, идею строения соединений – в химической символике Дальтона. Эта идея глобальна. Затем появляются первые экспериментальные данные, доказывающие влияние строения на свойства вещества (изомерия). Однако неопределенность понятий атом, молекула, элемент, атомная масса долгое время мешала выявлению строения соединений.

Использование дутя и флюсов в технологии получения железа (II тысячелетия до н.э.) свидетельствует об интуитивном применении законов термодинамики и кинетики химических процессов, которые получают экспериментальное подтверждение и теоретическое обоснование только в XX веке. Но это знание глобально, потому оно расчленяется на элементы – выделяется «теплота» как составной элемент, материальная субстанция; затем устанавливается связь между теплотой и движением частиц. Дальнейшее дифференцирование действительности привело к необходимости четкого различения таких сторон «теплоты», как «количество теплоты» и «интенсивность теплоты», «теплоемкости» и «скрытой теплоты изменения агрегатного состояния вещества» и т.д. Начинается упорядочивание свойств и отношений между компонентами реагирующей системы, устанавливаются различные взаимосвязи и отношения, формулируются фундаментальные законы термохимии, термодинамики и химической кинетики.

Анализ фактов показывает, что процесс эволюции химических концептов, зафиксированный и опредмеченный в орудиях производства и письменных источниках, подчиняется принципу системной дифференциации.

Если выделенные нами закономерности развития химических концептов соответствуют реальности, то организация формирующего эксперимента по программе, разработанной в соответствии с закономерностями становления данных структур, должна привести к более высокому росту показателей специальных способностей по сравнению с обучением, не учитывающим данные закономерности.

Цель формирующего эксперимента (Волкова, 2011) – формирование базовых понятийных отношений химии на основе учета естественного

порядка формирования химических концептов: зависимость свойств вещества от состава, строения и всей кинетической системы в целом. Разработанная нами образовательная программа обеспечивала переход от оперирования глобальными, недифференцированными образами химической реальности к оперированию все более дробными ее элементами, свойствами и отношениями.

Полученные нами результаты позволили экспериментально зафиксировать, что формирование химических концептов во всех выборках подростков соответствует правилу роста (по мере возрастного развития и освоения химии увеличивается когнитивная дифференцированность химических концептов) и правилу формы (увеличивается количество структурных уровней, на которых осуществляется репрезентация химических знаний).

Сравнительный анализ освоения химии в разных группах испытуемых показал, что недостаточная сформированность детализированного уровня концепта «вещество» у подростков контрольной выборки приводит к снижению объема долговременной памяти на сложную химическую информацию, уровня интереса к химии и показателя «химическая интуиция». У подростков экспериментальной выборки в результате целенаправленного формирующего эксперимента наблюдается более высокий уровень зрелости концептуальных структур химии, а именно: образуются концептуальные структуры химии детализированного уровня, что проявляется в статистически значимом росте показателей специальных химических способностей – таких, как «химическая память», «химическая интуиция» и уровень интереса к химии.

В ходе формирующего эксперимента было показано, что развитие концептуальных структур, обеспечивающих успешное освоение химии, влияет на развитие как вербального, так и невербального интеллекта (Волкова, 2011). Таким образом, целенаправленное развитие специальных химических способностей «ведет за собой» развитие интеллекта.

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РОЛЬ СЛОЖНЫХ СЛОВ В ФОРМИРОВАНИИ ЯЗЫКОВОЙ КАРТИНЫ МИРА (НА МАТЕРИАЛЕ САНСКРИТА)

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Языковая картина мира привлекает внимание лингвистов как своеобразный способ отражения представлений об окружающей действительности посредством языковых средств. Языковая картина мира в целом формируется системой ключевых понятий (перечень единиц) и связывающих их отношений (структура). В этом смысле сложные слова представляют собой интересный феномен как номинации явлений окружающей действительности, так и концептуализации мира.

Санскрит был выбран в качестве материала исследования не случайно. В санскрите представлен содержательный компонент (национальная картина мира) и интерпретационный компонент, который можно понять как своеобразие способа представлений знаний о мире. Этот способ, имеющий по преимуществу метафорический характер, связан с особым типом познания и оценивания мира и отношения к миру, к практической деятельности, который можно именовать как мифологизация концептуальной системы, или языковой картины мира. Незрелость абстрактного мышления компенсировалась мышлением образно-чувственным, а логический анализ заменялся метафорическим отождествлением непонятных природных феноменов с конкретными образами реально существующих или вымышленных существ.

Кроме того, особенностью языковой картины мира в санскрите является активное использование сложных слов как особого приема вторичной номинации. Сложное слово не просто называет предмет или явление окружающего мира, но характеризует его, указывая на яркие признаки, качества.

Например, *mūṣikāntakṛt* (*mūṣika* + *anta* + *kṛt*) – *кот* (букв. «истребляющий мышей», т.е. «полагающий конец мышинной жизни»).

Санскрит интересен тем, что этот древний язык, будучи вербальным отражением архаического мышления, представляет богатый материал, демонстрирующий метафорическое осмысление окружающего мира.

Например, *мертвец* может называться по характерному признаку: *mṛtāṅga* (*mṛta* + *aṅga*) (букв. «имеющий мертвое тело»); наряду с этим может употребляться метафорическое название:

gata-jīva («проживший (прошедший) жизнь»); поэтическое наименование: *kathāvaṣeṣa* (*kath* + *avaṣeṣa*) (букв. «*тот, о котором остаются только рассказы*»); а также наименование, основанное на мифологических представлениях о загробной жизни: *tridiva-gata* (букв. «*отправившийся в рай (на третье небо)*»).

Наименования в санскрите часто образны, производные слова мотивированы и долго сохраняют свою внутреннюю форму. Внутренняя форма слова всегда основывается на субъективном восприятии предмета. Поэтому один и тот же предмет может быть назван по-разному (явление синонимии в языке). Или наоборот, одно и то же слово может использоваться для называния совершенно различных предметов и явлений окружающего мира (явление омонимии в языке) (Карцевский, 2004).

Поскольку признаков, положенных в основу метафорического именования, может быть несколько, то каждый предмет может быть назван не одним, а несколькими именами. Например, *солнце* в санскрите характеризуется как:

dina-bandhu – «*друг дня*»;
dina-kaṭṛ – «*творец дня*»;
dinādhiṣṭha (*dina* + *adhīṣṭha*) – «*господин дня*»;
tigma-kara – «*излучающий жар*»;
jagaccakṣus (*jagat* + *cakṣus*) – «*око мира*»;
jana-cakṣus – «*глаз живущих*»;
tamo-ghna – «*рассеивающий мрак*»;
caṇḍāñṣu (*caṇḍa* + *añṣu*) – «*имеющий жаркие лучи*»;
tigma-didhiti – «*обладающий горячими лучами*»;
tigma-tejas – «*обладающий сильным жаром*»;
cakra-vāka-bandhu – «*друг красноватого гуся* (*cakra-vāka*)» (наименование основано на свойстве красноватого гуся спариваться только при солнечном свете);
mīna-gīṛi – «*враг рыб*» и т.п.

С другой стороны, одно и то же слово может использоваться для называния разных предметов и явлений. Это свойство имени, особенно ярко выраженное в древних языках, называется полисемантизмом.¹

Например, слово *go* имеет в санскрите несколько значений: 1) *бык*, 2) *бычья кожа*, 3)

¹ Впервые на полисемантизм как особое свойство имени в древних языках, отражающих архаичное мышление, обратил внимание А.А.Потебня. Замечание Потебни о полисемантизме древнего имени находит подтверждение в современных данных о первобытных языках и языках архаичных культур.

коровье молоко, 4) звезды, 5) лучи света, 6) ко-
рова, 7) земля, 8) речь.

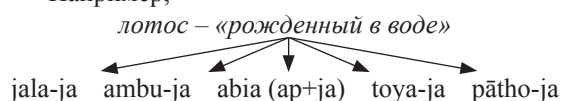
В санскрите наряду с именами, подробно характеризующими предмет, часто встречаются обобщенные именованности совокупности предметов. Например,

bile-ṣaṇa – «живущий в норах», т.е. «животное, которое живет в норе: еж, дикобраз, заяц, мышь или змея».

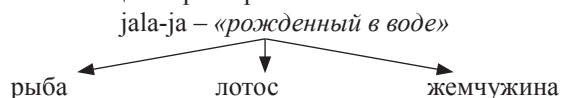
kumbhin – «имеющий выпуклости на голове», т.е. «крокодил или слон» и т.п..

Особенно важные понятия часто выражаются словами, включающимися в синонимические и омонимические ряды.

Например,



С другой стороны, в санскрите есть обобщенное наименование, которое может обозначать рыбу, лотос или жемчужину, основываясь на их общей характеристике:



Таким образом, сложные слова в санскрите характеризуют явления и предметы, структурируют действительность, т.е. являются своеобразным средством концептуализации мира.

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ЛАТЕРАЛИЗАЦИЯ ДВИГАТЕЛЬНОГО ПОВЕДЕНИЯ В ОНТОГЕНЕЗЕ КРЫС: МОДУЛИРУЮЩАЯ РОЛЬ СЕНСОРНОГО ПРИТОКА

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Изучение становления различных форм поведения животных в раннем онтогенезе является важным для понимания общих закономерностей, лежащих в основе механизмов обучения и памяти. Сроки формирования врожденных двигательных реакций у развивающихся крыс изучены достаточно хорошо. Однако существуют лишь немногочисленные работы, посвященные выявлению возможности обучения крыс поведенческим задачам на ранних сроках постнатального развития. В то же время отсутствуют данные о сроках формирования и динамике становления латерального предпочтения в использовании передней конечности у крыс в период раннего онтогенеза. Крысы, как и другие грызуны, обладают уникальным аппаратом тактильной локализации пространства при помощи максиллярных вибрисс. В литературе существует множество свидетельств ведущей роли вибриссного аппарата грызунов для обеспечения адекватного исследовательского поведения. Удаление вибрисс на начальных стадиях онтогенеза приводит как к значительным морфофизиологическим изменениям в сенсомоторной системе тактильной чувствительности и управления вибриссами у грызунов.

Целью данной работы было выяснение сроков латерализации двигательного пищедобывательного поведения крысят первого месяца жизни и роли сенсорного притока от вибрисс в становлении латерального предпочтения передней конечности у взрослых и развивающихся крыс. Тест на определение предпочтения передней конечности проводили в прозрачном боксе размером 20х30х40 см, в одной из стенок которого имелась горизонтальная трубка (с внешним диаметром 2,5 см и внутренним диаметром 1 см), через которую крысе подавалось пищевое подкрепление. Крысята могли доставать корм передней лапой из трубки, расположенной на высоте 2,5 см над поверхностью пола, а взрослые животные – на высоте 5 см.

В работе было использовано 90 животных пяти групп. Животных контрольной 1-й группы тестировали на латерализацию в предпочтении передней конечности при выполнении пищедобывательного теста (ричинг) однократно в возрасте 4-х месяцев. Три группы животных (2, 3 и 4) тестировали дважды: в возрасте 21–28 дней жизни и вторично в 4 месяца; во 2-й группе – без изменения сенсорной нагрузки, в 3-й – вслед за ранней сенсорной депривацией (билатеральное выстригание вибрисс с 1-го по 20-й дни жизни), в 4-й – после раннего увеличения сенсорного притока от вибрисс (билатеральная стимуляция вибрисс в течение 3 минут ежедневно с 8-го по 20-й дни жизни). Крыс 5-й группы подвергали вибриссной сенсорной депривации аналогично

Группы	n	Сенсорная нагрузка	Тест на 21–28-й дни жизни Амбидекстры (в%)		Тест в 4 месяца Амбидекстры (в%)	
1	13	–	–	–	+	10,3
2	27	–	+	66,7	+	44,4
3	17	депривация	+	53,0	+	35,3
4	20	стимуляция	+	50,0	+	15,8
5	13	депривация	–	–	+	7,2

Таблица 1. Группы крыс и распределение процента нелатерализованных животных (амбидекстров) при выполнении теста на предпочтение передней конечности (подробности в тексте).

животным 3-й группы, но тестировали однократно в 4 месяца (во взрослом состоянии).

Эксперименты показали, что обучение крысят выполнению пищедобывательного теста на третьей неделе жизни (2-я группа) само по себе оказывало значительное влияние на латерализацию предпочтения передней лапы при выполнении этого двигательного теста. В раннем возрасте предпочтение в использовании одной из передних лап наблюдалась у 33,3% крысят, большинство животных (66,7%) не проявили выраженной асимметрии в употреблении передней конечности при доставании пищи из трубки, т.е. были амбидекстрами. Далее, при тестировании тех же крыс в возрасте 4-х месяцев, амбидекстров в этой экспериментальной группе оказалось значительно больше (44%), чем среди протестированной животных 1-й контрольной группы (13,3%). Таким образом, обучение двигательному навыку в раннем возрасте влияло на латерализованность взрослых крыс, увеличивая долю амбидекстров, т.е. закрепляя «детский» характер латерального предпочтения.

Ранняя сенсорная вибриссная депривация как таковая (у животных 5-й группы) практически не изменяла характер латерализации: при выполнении пищедобывательного теста у взрослых крыс этой группы соотношение левшей, правшей и амбидекстров (57,1%, 35,7% и 7,2%) соответствовало таковому у контрольных взрослых крыс (10,3% нелатерализованных животных в 1-й группе).

В отличие от них крысята, прошедшие обучение выполнению теста в первый месяц жизни (во 2-й, так и в 3-й группах), показали низкий процент животных, латерализованных в возрасте первого месяца, а среди взрослых животных этих групп крысы также оставались амбидекстрами при выполнении теста (44,4% и 35,3% соответственно). Таким образом, вибрисэктомия оказывала менее выраженное воздействие

на латерализацию регистрируемых параметров, чем раннее обучение крысят пищедобывательному навыку. Мы предположили, что такое обучение приводит к значительному обогащению среды, в которой развиваются животные.

Для проверки такого предположения мы постарались сузить параметры обогащения. Для этого исследовали специфическое воздействие увеличения сенсорного притока именно от вибрисс: животных 4-й группы ежедневно с 8-го по 20-й дни жизни стимулировали вибриссы билатерально в течение всего 3-х минут в день. Среди стимулированных животных в ходе раннего тестирования: в возрасте 22–28 дней половина животных латерализовалась, а 50% одинаково часто пользовались как левой, так и правой лапой для доставания корма. При тестировании взрослых крыс этой группы было выявлено 15,8% правшей, 68,4% левшей и всего лишь 15,8% амбидекстров, что приближается к значениям для крыс контрольной 1-й группы.

Можно предположить, что раннее обучение манипуляторному навыку приводило к изменению схемы возникновения латерального предпочтения и отсутствию у значительного числа животных выраженной латерализации во взрослом состоянии. Ранняя вибриссная депривация сама по себе не влияла на латерализацию двигательного навыка в данном тесте. Однако, раннее обучение выявляло повреждающее действие такой депривации, приводя к потере латерального предпочтения большинством животных. Увеличение сенсорной нагрузки от вибрисс в раннем онтогенезе наоборот, ускоряло процесс становления латерализации при выполнении пищедобывательного теста. Таким образом, взаимодействие процессов латерализации двигательного поведения и параметров сенсорного притока в раннем онтогенезе крыс представляется достаточно сложным и неоднозначным и требует своего дальнейшего изучения.

ГЕНОТИП, КРЕАТИВНОСТЬ И ЭЭГ ФЕНОТИП: РОЛЬ ПОЛИМОРФИЗМА ГЕНА ТРАНСПОРТЕРА СЕРОТОНИНА

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Предыдущие исследования в области психогенетики выявили наследуемость не только многих психических заболеваний, но и когнитивных функций и психологических черт. Современный этап связан с выявлением ассоциаций отдельных генов-кандидатов с психическими функциями разного уровня, а также нейрофизиологических механизмов, лежащих в основе генетических различий (Ramus 2006). Гены, регулирующие активность серотониновой медиаторной системы мозга, рассматриваются как наиболее вероятные гены-кандидаты, ассоциированные с наследственными особенностями психики.

Ключевым белком, регулирующим функцию серотониновой системы, является трансмембранный белок – транспортер, осуществляющий обратный захват медиатора из синаптической щели в пресинаптические окончания и определяющий время действия медиатора на постсинаптические рецепторы (Blakely et al. 1994, Lesch 1997). В регуляторной части гена транспортера серотонина обнаружен полиморфный участок, 5-HTTLPR, состоящий из 16 (L) или 14 (S) повторяющихся элементов. Установлено, что S аллель вдвое снижает уровень экспрессии гена, количество белка-транспортера и скорость удаления серотонина из синаптической щели (Lesch et al. 1996). В коре мозга серотониновые рецепторы наиболее представлены во фронтальных отделах, имеющих важное значение в процессах творческого мышления. В связи с этим нами была поставлена задача исследовать взаимосвязь между полиморфизмом 5-HTTLPR и оригинальностью вербальной и образной творческой деятельности.

Обнаружено, что носители S/S и L/S генотипов имели более высокие показатели вербальной креативности в тесте создания предложений на основе триады существительных по сравнению с носителями L/L генотипа ($p < 0.01$ и 0.005 соответственно). Носители S/S генотипа имели также более высокие показатели образной оригинальности в задаче создания рисунка на базе незавершенного фрагмента по сравнению с носителями как L/S ($p < 0.05$), так и L/L ($p < 0.012$) генотипов. На основе полученных результатов нами было выдвинуто предположение о возможном накоплении S/S

в популяции, прошедшей отбор по интеллектуальным характеристикам.

Для его проверки мы произвели сравнение частоты S и L аллелей и соответствующих им генотипов полиморфизма 5-HTTLPR у студентов Новосибирского государственного университета и в выборке из общей популяции жителей Новосибирской области. Выявлено значительное увеличение частоты S аллеля (0.51) в выборке студентов по сравнению с выборкой жителей Новосибирской области (0.31, $p < 0.005$). Частота S/S генотипа в выборке студентов была значительно выше по сравнению с контрольной выборкой ($\chi^2 = 15.3$, $p < 0.01$).

Поскольку фоновая ЭЭГ является предиктором успешности осуществления ментальных функций (Anokhin et al. 1999, Foucher et al. 2004, Klimesh et al. 2006, Разумникова 2003, Вольф и Тарасова 2010), в следующей части нашего исследования был проведен анализ связанных с генотипом частотно-пространственных различий в фоновой ЭЭГ, записанной в состоянии покоя с закрытыми глазами. ЭЭГ регистрировали монополярно в 60 отведениях, расположенных в симметричных отделах правого и левого полушарий мозга. Мощность ЭЭГ определяли методом быстрого преобразования Фурье в индивидуальных частотных диапазонах (дельта, тета, альфа_{1,2,3}, бета_{1,2} и гамма). Удаление артефактов производилось на основе анализа ЭЭГ методом независимых компонентов.

Различия фоновой ЭЭГ, связанные с генотипом, обнаружены в дельта, тета и бета₂ частотных диапазонах.

В диапазоне дельта ритма генетические различия связаны с разной степенью асимметрии мощности в правом и левом полушариях мозга. Взаимодействие факторов ГЕНОТИП × ОБЛАСТЬ МОЗГА × ЛАТЕРАЛЬНОСТЬ ($P < 0.004$). Наиболее выраженные латеральные различия мощности наблюдались для S/S генотипа, который отличался от других генотипов как по количеству областей, для которых были характерны межполушарные различия, так и по их амплитуде. Различия в амплитуде асимметрии ритма между генотипами отсутствовали только для затылочных и париетальных областей.

В тета частотном диапазоне различия, связанные с генотипом, были полосспецифичны (ПОЛ × ГЕНОТИП, $P < 0.04$). У женщин наблюдались более низкие значения мощности при S/S, а у мужчин – при S/L генотипах. При этом мощность тета ритма у женщин с генотипами

S/S и L/L была ниже, чем соответствующие значения у мужчин.

В диапазоне бета2-ритма выявлено взаимодействие факторов ПОЛ x ГЕНОТИП x ОБЛАСТЬ МОЗГА ($P < 0.001$). Половые различия были наибольшими между носителями S/L генотипа, для которого в передних отделах коры мозга у женщин мощность ритма была выше, чем у мужчин ($P < 0.03$).

Таким образом, проведенное исследование показало ассоциацию S/S генотипа с креативностью и его накопление в студенческой популяции, прошедшей отбор по интеллектуальным способностям при поступлении в университет. Имеется большое количество данных, свидетельствующих об ассоциации S аллеля с нейротизмом (Lesch et al. 1996), повышенным риском развития депрессии и суицида (Lesch 2004, Kato 2007), антисоциальным поведением (Beitchman et al. 2006, Liao et al. 2004), склонностью к наркомании и алкоголизму (Feinn et al. 2005, Gerra et al. 2004). В то же время, S аллель широко распространен в человеческих популяциях и преобладает у народов Юго-Восточной Азии. Такое широкое распространение S полиморфизма, ассоциированного с негативными психическими последствиями,

кажется парадоксальным. Полученные результаты позволяют полагать, что сохранение S аллеля, несмотря на его отрицательное воздействие на психику, может быть обусловлено таким связанным с ним признаком, как высокая креативность. Проанализировав полученные к настоящему времени данные, Дж.Р. Хомберг и К.Р. Леш (Homborg and Lesch 2011) также отмечают, что носители S аллеля превосходят носителей длинного аллеля в ряде когнитивных функций и способности к социальной адаптации.

Анализ связанных с генотипом особенностей фоновой ЭЭГ выявил взаимодействие генотипа с полом испытуемых. Заслуживает внимания тот факт, что эти взаимодействия обнаружены для тета и бета2 частотных диапазонов, в которых, по данным наших исследований, наблюдаются наибольшие половые различия при решении дивергентных творческих задач (Volf et al. 2007, Razumnikova et al. 2007). Это открывает дальнейшие перспективы для исследования взаимодействий гены – мозг – поведение в процессах творческой деятельности, указывая на важность изучения осцилляторной активности мозга в ее взаимодействии с генотипом и полом.

ОСОБЕННОСТИ ГЛАЗОДВИГАТЕЛЬНОЙ АКТИВНОСТИ В ПРОЦЕССЕ ЧТЕНИЯ У ЛИЦ, СТРАДАЮЩИХ ШИЗОФРЕНИЕЙ

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Шизофрения – одно из самых распространенных психических заболеваний, и исследования в области изучения когнитивных особенностей и диагностики данного заболевания остаются значимыми на протяжении многих десятилетий. В последнее время для этой цели все чаще используются современные методы исследования, в частности, метод регистрации движений глаз (eye-tracking).

С помощью этого метода нами было проведено исследование различий визуального восприятия вербальной информации у лиц с шизофренией и психически здоровых людей.

Основной целью являлось проверить гипотезу о том, что нарушения возникают уже на уровне отбора и восприятия материала, а не на этапах его дальнейшей обработки в ходе процесса мышления.

Мы попытались исследовать, существуют ли различия (и если да, то какие) в распределении внимания при восприятии вербальной информации (текста) у здоровых людей и у лиц, страдающих шизофренией.

В исследовании приняли участие 50 человек в возрасте от 18 до 53 лет, 25 из которых составили контрольную группу, мужчины и женщины без какой-либо психической патологии. В экспериментальную группу вошли 25 человек, женщины, пациентки 6 отделения городской психиатрической больницы № 6 с диагнозом «шизофрения». Отбор в экспериментальную группу проводился на основе данных анамнеза.

Во время проведения исследования был использован прибор Tobii X120 Eye Tracker, который регистрирует движения глаз.

Направление взгляда человека является отражением того, куда направлено и его внимание в данный момент, т.е. на самый релевантный в данный момент стимул из всей окружающей обстановки. И даже если человек субъективно воспринимает свой взгляд как «скользящий»,

в действительности он все равно совершает фиксации на наиболее значимых стимулах. Так, человек фиксируется на наиболее значимых по смыслу словах в тексте, своеобразных «ключях», которые позволяют понимать общий смысл написанного.

Нами были отобраны различные текстовые стимулы, все они предъявлялись на короткое время – от 5 до 20 с. После каждого текста следовала маска, во время предъявления которой испытуемых просили кратко рассказать переносный смысл прочитанного.

После этого нами была проанализирована глатодвигательная активность; произведена математическая обработка и обнаружены следующие статистически значимые закономерности:

1) участникам экспериментальной группы требуется гораздо больше времени на весь процесс чтения, при этом количество фиксаций несущественно больше, чем у контрольной группы. Таким образом, каждая отдельная фиксация также дольше, чем у здоровых людей;

2) больные уделяют незначительное внимание (либо не уделяют его вообще) названию, которое зачастую включает в себя главную идею текста. Здоровые люди, зная это, читают его в первую очередь; больные, напротив, если и обращаются к нему, то, как правило, уже после начала чтения в качестве одной из регрессий;

3) у контрольной и экспериментальной групп статистически различается соотношение количества и времени фиксаций на смысловых «зонах интереса» и всех остальных зонах. Здоровые люди значительно больше сосредотачиваются на ключевых по смыслу зонах.

Стоит также отметить, что у лиц с шизофренией в целом распределение фиксаций по тексту более равномерное, чем у здоровых, т.е. они имеют тенденцию к меньшей дифференциации текста, исходя из смысловой нагрузки различных слов. Если здоровые выделяют четкие смысловые «ключи», то для больных шизофренией текст является более «уплощенным». Однако для статистического подтверждения такой тенденции еще требуется дополнительная обработка.

Кроме того, при сравнении качественного анализа ответов испытуемых (ошибки и искажения, которые присутствовали) и распределения

фиксаций на тексте, выявляются некоторые закономерности. Пересказ и анализ переносного смысла текстов испытуемыми определенным образом отражаются на карте фиксаций в процессе чтения (например, пациент при пересказе после предъявления текста уделяет внимание некоторым маловажным деталям, при этом на карте фиксаций мы видим, что количество и длительность фиксаций на этих словах значительно выше, чем на других частях текста).

Таким образом, после подсчета, статистической обработки и анализа результатов, выяснилось, что у двух групп различия в восприятии вербальной информации действительно существуют, и, вероятно, когнитивные искажения, присущие больным шизофренией, начинаются уже на стадии восприятия информации (в данном случае – текста), усугубляясь при дальнейшей смысловой обработке на фазе мышления. Кроме того, при анализе распределения внимания (фиксаций на тексте) можно говорить и о характере присутствующих искажений, а не только их наличии.

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ГЕНОТИП-СРЕДОВЫЕ ДЕТЕРМИНАНТЫ КОГЕРЕНТНОСТИ ЭЭГ

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В современной электроэнцефалографии общепризнанным показателем функционального взаимодействия корковых областей является рост степени синхронизации ритмических составляющих ЭЭГ, оцениваемый с помощью показателей функции когерентности. Анализ показателей функции когерентности используется для изучения морфофункциональной организации коры, как в состоянии покоя, так и в процессе когнитивной деятельности.

Применение анализа когерентности для изучения кортикальных связей основано на предположении, что когерентность между двумя сигналами ЭЭГ отражает функциональные отношения между лежащими в основе кортикальными областями. Так как значения когерентности зависят от стабильности, мощности и фазовых связей между сигналами, любые факторы, воздействующие на ковариацию пространственно-распределенных сигналов ЭЭГ, должны влиять и на значения когерентности. В работе Gmehlin D. и соавторов (2011) было показано, что степень синхронизации электрической активности мозга растет на протяжении школьного возраста, достигая наибольших значений в альфа-диапазоне и в левом полушарии. В последние годы наблюдается рост интереса к оценке генотип-средовых влияний на степень синхронизации электрической активности мозга, оцениваемой с помощью функции когерентности, что рассматривается в качестве возможного эндофенотипа когнитивных функций (Smit D. J. A. et al. 2007).

Проведенные исследования G. C. M. Van Baal и др. (1998) по нахождению генетических и средовых влияний на кортико-кортикальные связи показали, что в группе 5-летних близнецов значительная часть изменений была объяснена генетическими влияниями. Оценки наследуемости когерентности всех кортико-кортикальных связей (без выделения частотных поддиапазонов) различались от 30 до 71%, при этом среднее значение наследуемости составило 49%. В другом исследовании 5-летних и 7-летних близнецов, выполненном Van Baal G. C. M. и соавторами (2011), было обнаружено, что в возрасте пяти лет среднее значение наследуемости когерентности ЭЭГ (частотный диапазон от 0,5 до 30 Гц) составляет в среднем 61% для левого

полушария и 49% для правого; в возрасте семи лет – в среднем 59% для левого и 62% для правого полушария. Данные результаты авторы интерпретировали в связи с тем, что генетические воздействия на когерентность могут принимать различные формы. Так, генетические факторы могут влиять посредством белков (например, через олигодендроцит – специфический белок, клетка глии, образующая миелиновые оболочки нервных волокон в ЦНС), воздействующих на диаметр аксона, плотность ионного канала и миелинизацию, или посредством белков (например, факторы роста), влияющих на различные аспекты синаптических связей, таких как синаптогенез, отросток аксона, увеличение существующих синаптических терминалов.

Цель: выявить особенности пространственной синхронизации электрической активности мозга в состоянии покоя, оценить вклад факторов генотипа и среды в их фенотипическую вариативность.

Объект исследования – монозиготные и dizиготные однополые близнецы в возрасте от 14 до 21 года. Общее количество пар – 178. Всего МЗ – 91 пара (среди них мужского пола – 36 пар, женского – 55 пар), ДЗ – 87 пар (мужского пола – 39 пар, женского – 48 пар). Средний возраст испытуемых – 18,2 года. Все испытуемые без отклонений в состоянии здоровья, участвовали в исследовании добровольно.

Для записи ЭЭГ использовался сертифицированный электроэнцефалограф «Энцефалан», версия «Элитная-М» 5.4–10–2.0 (13.02.2004) производства МТБ «Медиком» г. Таганрог. Регистрация осуществлялась в изолированной комнате. Запись ЭЭГ проводилась по международному стандарту установки электродов по схеме 10%-20%. Для регистрации электрической активности мозга устанавливался 21 электрод (Fpz, Fz, Cz, Pz, Oz, Fp1, Fp2, F7, F3, F4, F8, T3, C3, C4, T4, T5, P3, P4, T6, O1, O2), применялась монополярная схема с ипсилатеральными ушными референтами. Сопротивление электродов не превышало 10 кОм. Фильтрация ЭЭГ осуществлялась в диапазоне 0,5–70 Гц. Последовательность функциональных проб при записи ЭЭГ: «фон», «открыть глаза» (ОГ), «закрыть глаза» (ЗГ).

Для отслеживания и подавления артефактов использовались регистрация электромиограммы (ЭМГ), электроокулограммы (ЭОГ), электрокардиограммы (ЭКГ). Анализ спектра мощности осуществлялся в частотных диапазонах (дельта (0,5–4 Гц), тета (4–8 Гц), альфа1 (8–11

Частотный диапазон	Отведения									
	O1	O2	P3	P4	C3	C4	T3	T4	Fp1	Fp2
дельта	0,34	0,32	0,30	0,31	0,19	0,24	0,15	0,31	0,32	0,11
тета	0,14	0,14	0,15	0,31	0,13	0,22	0,13	0,23	0,14	0,03
альфа1	0,15	0,13	0,13	0,05	0,08	0,16	0,07	0,28	0,37	0,29
альфа2	0,15	0,10	0,08	0,19	0,12	0,18	0,12	0,09	0,20	0,17
бета1	0,20	0,21	0,27	0,28	0,19	0,19	0,14	0,19	0,35	0,10
бета2	0,05	0,14	0,08	0,06	0,06	0,10	0,14	0,02	0,08	0,19

Таблица 1. Значение показателя наследуемости когерентности ЭЭГ

ГЦ), альфа2 (11–13 Гц), бета1 (13–24 Гц), бета2 (24–35 Гц) диапазонах. Математическая обработка данных осуществлялась с использованием программы Statistica 6.0.

Результаты.

Из записи фоновой ЭЭГ выделялись безартефактные участки длительностью 1000 мс, для которых получались оценки когерентности каждого из 21 регистрируемых отведений со всеми оставшимися, при этом учитывались частотные диапазоны. Полученные оценки когерентности усреднялись для монозиготных и дизиготных близнецов.

Оценка генетических влияний проводилась с применением коэффициента наследуемости Игнатьева: $h^2 = 2(r(MZ) - r(DZ))$, где $r(MZ)$ - внутрипарная корреляция монозиготных близнецов; $r(DZ)$ - внутрипарная корреляция однополых дизиготных близнецов.

Усредненные значения показателя наследуемости когерентности электрической активности для окципитальных, парietальных,

центральных, темпоральных и передне-фронтальных областей для каждого из шести выделяемых частотных диапазонов представлены в таблице 1.

Анализ полученных нами данных позволяет сделать вывод о том, что вклад наследственных факторов в различия в степени синхронизации (когерентности) ЭЭГ различается для выделенных частотных диапазонов (что связано с их генезом), а также для различных областей коры.

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ДИНАМИКА ФУНКЦИЙ ПРОИЗВОЛЬНОЙ РЕГУЛЯЦИИ ДЕЯТЕЛЬНОСТИ В МЛАДШЕМ ШКОЛЬНОМ ВОЗРАСТЕ

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Функции программирования, регуляции и контроля сложных форм психической деятельности, т.е. функции III блока, по А. Р. Лурия (1973), или управляющие функции, являются одними из ведущих в осуществлении практически любого вида психической деятельности, поскольку включают в себя способность предвосхищать, ставить цели, планировать, регулировать действие и отслеживать результаты. Особое значение они приобретают в младшем школьном возрасте, когда, с одной стороны, происходят интенсивные мозговые перестройки, связанные

с возрастанием специализации лобных областей коры, а с другой – система школьного образования предъявляет ребенку требования, напрямую адресованные к возможностям управлять своим поведением и произвольно регулировать психическую деятельность.

Как показывают исследования, степень зрелости функций III блока оказывается различной у детей с неодинаковой успешностью обучения (Полонская, 2008), а также обнаруживает взаимосвязи с будущими успехами в профессиональной жизни (Diamond et al., 2007). В этой связи чрезвычайно важной представляется задача проследить изменения, происходящие в столь сложный и динамичный для данных функций период. С этой целью нами было предпринято исследование уровня сформированности

отдельных компонентов III блока, а именно компонента произвольной регуляции деятельности и компонента серийной организации движений и действий.

В лонгитюдном исследовании приняли участие 40 испытуемых, учащихся московской средне-образовательной школы, с которыми проводилось нейропсихологическое обследование последовательно в первом, втором и третьем классах (Ахутина и др., 2008). Для оценки функций III блока использовалось 11 проб, 5 из которых направлены на исследование серийной организации движений и действий, а 6 позволяют изучить состояние компонента произвольной регуляции деятельности. Для сравнения обнаруживаемой динамики анализировалось также состояние зрительно-пространственных функций, было использовано 6 проб.

Рассмотрение общегрупповой динамики отдельных компонентов функций III блока не обнаруживает значимых различий между классами. В первом, втором и третьем классе средние значения интегрального показателя функции произвольной регуляции составили $-0,38$ (5,23)¹, $-1,58$ (3,88) и $-1,90$ (3,64) соответственно. Показатели функций серийной организации от первого к третьему классу составили: $-0,71$ (5,15), $-2,35$ (4,64) и $-3,64$ (4,44). Что касается функций переработки зрительно-пространственной информации, то их показатели в первом, втором и третьем классе составили $-3,31$ (8,60), $-3,49$ (9,36) и $-7,66$ (8,58). Сравнение значений показателей в первом и третьем классе показали значимость различий по всем трем индексам ($p=0.039$, $p=0.004$ и $p=0.001$ для функций произвольной регуляции, серийной организации и переработки зрительно-пространственных функций соответственно). При этом, несмотря на отсутствие значимых различий, обращает на себя внимание относительно большой прогресс в развитии функций, связанных с III блоком по сравнению с переработкой зрительно-пространственной информации от первого ко второму классу. Сравнение показателей во 2 и 3 классе позволяет отметить обратную тенденцию: на фоне незначительного улучшения функций III блока у испытуемых наблюдается значительный прогресс в переработке зрительно-пространственной информации (различия между 2 и 3 классом по этому параметру значимы на уровне $p=0.01$ по критерию Вилкоксона).

¹ Здесь и далее положительные значения интегральных показателей отражают низкий уровень сформированности исследуемых функций. В скобках дано значение стандартного отклонения показателей.

Следует отметить, что большая величина стандартных отклонений во всех срезах указывает на крайнюю неоднородность данных, что подтверждает тезис о неравномерности развития психических функций (Ахутина, Пылаева, 2008). В связи с этим было принято решение разбить выборку на группы, в зависимости от состояния отдельных компонентов исследуемых функций. Для исследования характера изменений выборка была разбита на три подгруппы, в зависимости от состояния функции произвольной регуляции деятельности: (1) испытуемые с хорошим состоянием функции программирования и контроля в первом классе (значение индекса выше среднего по группе на одно и более 0.5 стандартного отклонения, 15 человек); (2) испытуемые со средним состоянием функции программирования и контроля в первом классе (значение индекса отличается от среднего по группе не больше, чем на 0.5 стандартного отклонения, 15 человек); (3) испытуемые с плохим состоянием функции программирования и контроля в первом классе (значение индекса ниже среднего по группе на 0,5 и более стандартного отклонения, 9 человек). Сопоставление динамики изменения показателей функций произвольной регуляции в выделенных группах показало, что наиболее значимые изменения наблюдаются в группе с изначально низким уровнем развития анализируемой функции (7,36 (3,92), 1,43 (3,29) и 1,48 (2,39) в первом, втором и третьем классе соответственно, уровень значимости различий между 1 и 3 классом – $p=0.018$ по критерию Вилкоксона). При этом изменения обсуждаемых функций в группе детей с высокими начальными показателями практически не происходят ($-4,88$ (1,37), $-3,79$ (2,60) и $-3,99$ (2,86) в трех срезах соответственно). В группе со средними исходными показателями наблюдается некоторое улучшение показателей, но оно не достигает уровня значимости ($-0,53$ (1,81), $-1,19$ (4,09) и $-1,85$ (3,53) в трех срезах соответственно).

Применение описанной методики разбиения выборки на подгруппы по показателям серийной организации и переработки зрительно-пространственной информации дало аналогичные результаты: дети, имеющих изначально худшие результаты, демонстрируют значительно больший прогресс по сравнению с детьми, получившими высокие оценки соответствующих функций в первом классе.

Полученные данные о более отчетливом прогрессе функций III блока от первого ко второму классу, а также зрительно-пространственных функций от второго к третьему классу находят подтверждение в данных нашей большей

выборки и в результатах лонгитюдного исследования детей 1–4 классов (Полонская, 2007). Одним из возможных объяснений этих фактов может быть представление о цикличном развитии лево- и правополушарных функций, развиваемое Робертом Тэтчером (Thatcher, 2007).

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РОЛЬ ПРЕДМЕТНОЙ ИДЕНТИФИКАЦИИ ИСТОЧНИКА АКУСТИЧЕСКОГО СОБЫТИЯ В ФОРМИРОВАНИИ ЭМОЦИОНАЛЬНОЙ СОСТАВЛЯЮЩЕЙ ЕГО ВОСПРИНИМАЕМОГО КАЧЕСТВА

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В основу выполненного исследования положена «парадигма воспринимаемого качества», поэтому в центре внимания оказываются не отдельные характеристики восприятия, а совокупность значимых для субъекта характеристик события – его воспринимаемое качество, включающее эмоциональную составляющую. Мы исходили из предположения, что в акустической среде существуют звуковые события, различающиеся степенью и типом эмоционального воздействия на человека. Если в составе воспринимаемого качества, выявленном эмпирическими методами, какая-либо эмоциональная характеристика отсутствует (или статистически слабо представлена), то это означает, что данное событие эмоционально нейтрально. Присутствие эмоциональных составляющих в вербальных описаниях воспринимаемого качества акустического события позволяет говорить об их содержании и степени представленности среди других составляющих (Носуленко, 2007).

Стимульный материал (акустические события): отбойный молоток (перфоратор) (эмоция «гнев»), женский шёпот («интерес»), мужская рвота («отвращение»), детский плач («печаль»), мужская отрыжка («презрение»), детский смех («радость»), рык животного («страх»), сдувающийся шарик («стыд»), космический радиосигнал (синтезатор) («удивление»).

Участники исследования – студенты гуманитарных факультетов московских ВУЗов в количестве 121 человека в возрасте от 18 до 54

лет (средний возраст 20 лет, 70% выборки составляют женщины, 30% – мужчины).

Процедура эмпирического исследования. Участнику исследования, находящемуся в звукоизолированной затемненной комнате, в свободном звуковом поле последовательно предъявлялось одно из девяти акустических событий. После прослушивания акустического события участники описывали предъявляемое звучание по направлениям, заданным процедурой полуструктурированного интервью. Эти направления ориентировали слушателей: (1) на описание воспринимаемого источника звука и общего контекста звучания, (2) на характеристику вызываемых данным звуком ассоциаций, (3) на оценку отношения участника к звучанию («нравится – не нравится») и (4) на определение эмоции, которая в этом звучании распознается. Ответы испытуемого фиксировались экспериментатором в журнале и записывались на диктофон. Далее испытуемому предъявлялось следующее акустическое событие. Все речевые высказывания, полученные в рамках основного эмпирического исследования, дословно переводились в текст, который подвергался последующей обработке в соответствии с процедурой системного анализа вербализаций (Носуленко, Самойленко, 1995; Самойленко, 2010). Данная процедура позволяет осуществлять количественный анализ представленности разных категорий вербальных единиц в соответствии с их отнесенностью к той или иной составляющей воспринимаемого качества.

Согласно полученным вербальным данным, стабильность и однозначность распределения эмоциональных составляющих воспринимаемого качества акустического события связана

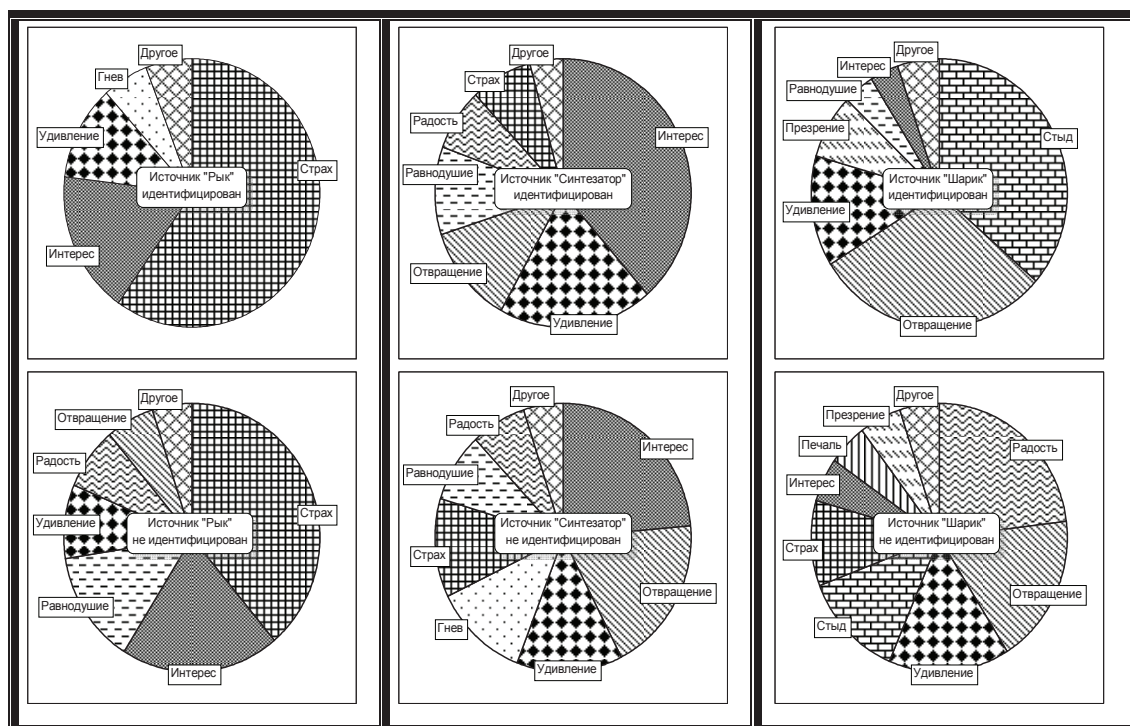


Рис. 1. Эмоциональные составляющие в описаниях звуков для ситуаций правильной и неправильной идентификации источника звука.

с предметной идентификацией слушателем источника этого события. С помощью критерия χ^2 Пирсона было выявлено, что эмоция, заложенная в звуке, узнается чаще в случае правильной идентификации источника звука, чем при ошибочной идентификации ($p < 0,0001$) (см. рис. 1).

В психоакустических исследованиях неоднократно подтверждалась роль предметности и идентификации источника звука в его восприятии. Так, при анализе восприятия виртуальных звуков и изображений было показано, что целостный образ формируется тогда, когда и звук и изображение оцениваются человеком как принадлежащие одному и тому же источнику (Nguen et al., 2010). Эксперименты подтвердили мультимодальную природу слухового восприятия и его зависимость от опыта взаимодействия человека с конкретным источником воспринимаемого звука (Даниленко, Носуленко, 1991; Носуленко, 2007; Теплов, 1985).

Вывод. Эмоциональная составляющая воспринимаемого качества связана с предметной идентификацией источника акустического события: чем адекватнее идентифицируется источник звука, тем чаще распознается базовая эмоция.

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МОЛЕКУЛЯРНО-ХИМИЧЕСКИЕ АСПЕКТЫ РЕГУЛЯЦИИ КОГНИТИВНЫХ ПРОЦЕССОВ: ЭНДОГЕННЫЕ НЕЙРОПЕПТИДЫ И ИХ СИНТЕТИЧЕСКИЕ МОДИФИКАЦИИ

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Мозг и его работа – одна из величайших загадок нашего мира. Процессы, идущие в мозге, могут быть связаны с реакциями на внешние раздражители, могут являться следствием наложения воспоминаний о контакте с внешним миром, а могут попросту являться продуктами какой-то собственной внутренней работы (как это, например, происходит при психических расстройствах и галлюцинациях). При этом физиологическое состояние человека будет отражать ту реальность, которую создает его сознание (например, образование стигматов у верующих, или возникновение соматических заболеваний, или наоборот – эффект «плацебо» и т. д.). С другой стороны, практики йогов свидетельствуют о том, что определенное поведение, работа физического тела и дыхательные практики, усиленные концентрацией внимания, способны значительно менять сознание, самосознание и мироощущение человека. Каким образом пение мантр (особых священных текстов) или «бабушкины заговоры» (определенная ритмическая последовательность слов и звуков) способны в огромной степени влиять на состояние человека? Что является связующим звеном между физиолого-химическими процессами материально существующего мозга (во всей его архитектурной сложности, с учетом условий окружающей среды и физических раздражителей) и такими понятиями как мысль, сознание, язык?

С другой стороны, на многие мыслительные процессы (память, волю, решимость, отношение к чему-либо) можно активно влиять при помощи определенных химических молекул. В последние годы все больший интерес приобретает проблема поиска так называемых «когнитивных энхансеров» (cognitive enhancing drugs – препаратов, усиливающих когнитивные функции мозга). Подобные средства могут быть эффективными не только при заболеваниях, связанных с ухудшением интеллектуальных способностей человека, например, при болезни Альцгеймера, шизофрении или депрессии,

но и при возникающих с возрастом мягких когнитивных нарушениях, но также способны усиливать внимание и служить стимуляторами памяти у вполне здоровых людей. Особое место среди подобных молекул занимают регуляторные пептиды и их модифицированные синтетические аналоги. Отличительными чертами подобных молекул являются: высокая физиологическая активность, многофункциональность и широкий спектр действия, минимум побочных эффектов при применении, наличие трофических, нейропротекторных, медиаторных и других свойств. Кроме того, известно, что универсальными регуляторами практически всех физиологических функций организма являются не отдельные пептиды, а целые пептидные комплексы, действующие совместно и в определенной последовательности. Состав таких комплексов – не случаен. Попытки определения какого-либо ведущего пептида, регулирующего тот или иной процесс, всегда сопровождаются открытием целого ряда других совместно взаимодействующих регуляторов (такие комплексы были названы синактонами). Одним из путей образования комплексов синактонов в мозге является их биосинтез посредством протеолиза из определенного белка-предшественника или протопептида и последующих его производных (продуктов протеолиза). Причем в определенном месте и в определенный момент времени происходит образование множества коротких пептидов (структура которых не случайна), также обладающих биологической активностью и находящихся во взаимодействии. Полифункциональность одного пептида и обеспечение функции посредством нескольких нейропептидов, существование в организме уникальных для различных тканей и органов пептидных пулов, состав которых динамически изменяется, альтернативные пути деградации регуляторных пептидов с образованием, как правило, биологически активных фрагментов, а также многие другие факты (влияние пептидов на внутриклеточную Ca^{2+} сигнализацию, активацию ряда генов, выброс сигнальных молекул в межклеточное пространство и т. п.) свидетельствуют о сложной организации процессов пептидной регуляции, о функционировании, по-видимому, единой системы регуляторных нейропептидов, тесно сопряженной с другими

системами организма. Являясь фактически «регуляторами регуляторов», нейропептиды способны активировать целые каскады биохимических реакций в клетке, причем отсроченные эффекты введения пептидов могут наблюдаться спустя часы и даже сутки после введения. Следуя логике, любой мыслительный процесс сопровождается выбросом нейромедиаторов, меняющих состав пептидного пула в месте выброса, как следствие – реакция соседних клеток (не только нейронов, но и глиальных) – передача «информационной волны», то есть создание уникальной картины химической активности, при этом любой аспект (внешние условия, настроение, звуки, состояние физического тела и т.п.) даст иную химическую картину, другими словами – иную кодировку информации в мозге.

В своей работе мы попытались приоткрыть молекулярный механизм действия эндогенных пептидных регуляторов и их синтетических аналогов, подробно рассмотрев такие ключевые моменты процесса, как биодegradация с образованием биологически активных фрагментов и специфические взаимодействия с рецепторными системами на поверхности нервных клеток. Нам удалось обнаружить существование мест специфических взаимодействий некоторых биологически активных радиоактивно меченых регуляторных пептидов на плазматических мембранах нервных клеток, показать влияние

агонистов и антагонистов известных нейрорецепторов на специфическое связывание некоторых радиоактивно меченых регуляторных пептидов. Кроме того, установлено существование высокой модуляторной активности пептидов в отношении различных рецепторных систем организма, показано существование уникального спектра действия, характерного для каждой конкретной биологически активной пептидной молекулы, но сходного по характеристикам для родственных пептидов (принадлежащих к одной группе). Другими словами, регуляторные пептиды снижают либо повышают чувствительность рецепторов (каких и на сколько – зависит от структуры пептида, места приложения и молекулярного окружения) к собственным лигандам. По-сути, происходит практически одновременная, уникальная на данный момент состояния организма, мягкая регуляция нейромедиаторной активности мозга.

Таким образом, при изучении когнитивных процессов всегда следует учитывать, что молекулярно-химическая составляющая работы мозга является одним из важнейших механизмов не только осуществления сложных поведенческих актов, но и поддержания нормальной работы организма в целом.

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ОТ ЛОКАЛИЗАЦИИ ФУНКЦИЙ К ЛОКАЛИЗАЦИИ ЗНАНИЙ

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Вся история нейронауки – это история изучения разнообразных функций и поиска локализации этих функций в определенных структурах мозга. Приходится констатировать, что на пути «коррелятивных» исследований, когда сопоставляется «что угодно, с чем угодно» на психологическом и физиологическом уровнях, «привязать» функции к структурам так и не удалось. Накапливается все больше данных, противоречащих устоявшимся взглядам, например, в вопросах о межполушарной асимметрии, о речевых зонах, о первичных корковых полях, и пр., и большинство функций рассматривается как распределенные системы.

Появление новых методов исследования активности мозга создает иллюзию, что нейронаука получила действенные инструменты для исследования когнитивных процессов. Действительно, новые методы картирования активности мозга (fMRI, PET, MEG, и др.) позволяют использовать их для исследования самых разных аспектов ментальных процессов. Однако разнообразие интересов исследователей пока лишь увеличивает полководье данных, которые, как в калейдоскопе, остаются трудно сопоставимыми узорами. В литературе насчитывается несколько тысяч разнообразных психических процессов, и число их со временем только растет (Vanderwolf, 1998). За последние годы когнитивная наука стала еще большим «клубком разнородных идей и фактов», подтверждая характеристику, данную ей около 30 лет назад (Величковский, 1982). Прогресс в когнитивных исследованиях сдерживается отсутствием эволюционного критерия для признания только таких когнитивных процессов, которые имеют онтологический статус.

Эволюционный подход к изучению организмов – субъектов поведения позволяет положить конец произволу в выделении «каких угодно» мозговых функций и когнитивных процессов. В системно-эволюционном подходе к изучению поведения, мозга и психики (В. Б. Швырков, 2006) субъект поведения рассматривается как «сгусток» опыта, отражающий видовую и индивидуальную истории соотношения субъекта со средой. Элементы опыта – это фиксированные в системах нейронов модели соотношений организма со средой, поведенческих актов. В проблемных ситуациях, при научении, когда

имеющегося опыта недостаточно для достижения нужного организму результата, нейроны самоорганизуются в системы, приобретая специфичность относительно конкретного поведенческого акта. Неизменность поведенческой специализации нейронов позволила использовать поведенческую специализацию нейронов в качестве метода выделения элементов в структуре индивидуального опыта. Поведенческая системная специализация является общей характеристикой всех нейронов, а различия в специализациях нейронов определяются «возрастом» систем – временем их формирования в фило- и онтогенезе. Как было показано (Александров, 1989; Швырков, 1993), разные области мозга отличаются паттернами поведенческой специализации нейронов, то есть разной представленностью в них разных элементов опыта. Используя регистрацию активности нейронов в сходном инструментальном пищевом поведении у животных разных видов, можно выявить видовые особенности организации активности разных областей мозга и особенности структуры индивидуального опыта, а обучая одному и тому же поведению разными способами (поэтапно, одномоментно, с закрытыми на момент обучения глазами, путем наблюдения за демонстратором и др.) – ответить на вопросы об особенностях формируемой структуры опыта в зависимости от истории и процедуры обучения.

Зарегистрированные у людей «гностические» нейроны, такие, как «зеркальные», «слов», «лиц», «сознания», позволяют предполагать, что нейроны различных областей мозга человека специализированы относительно различных областей знания, усваиваемых на разных стадиях развития, обучения и образования.

Ранее нами было экспериментально обосновано, что суммарная электрическая активность мозга (ЭЭГ) может служить методом исследования динамики отношений между элементами в структуре индивидуального опыта, складывающейся в той или иной структуре мозга при формировании и реализации поведения (Максимова, Александров, 1987; Гаврилов, 1987). Анализ колебаний ЭЭГ, усредненных от отметок поведения в инструментальном пищевом поведении у кроликов и крыс, выявил динамику реализации и смен элементов опыта разного возраста, а также количества одновременно активированных элементов опыта.

Нами также была предпринята попытка установить отражение в потенциалах мозга

актуализации знаний по разным дисциплинам, приобретенным в разных классах школы. Мы регистрировали ЭЭГ у испытуемых, которые классифицировали слайды из школьных учебников по биологии, географии, математики из 5, 7, 9-го классов в двух ситуациях: при определении дисциплины из смешанной последовательности слайдов одного класса и при определении класса из перемешанных слайдов одной дисциплины. Группы слайдов были уравнены по интенсивности. ЭЭГ усредняли от момента появления слайда на экране, а также от вербального отчета. Оказалось, что конфигурация усредненных ЭЭГ-потенциалов сходна над разными областями мозга, что свидетельствует о системной организации мозговой активности, при этом выявлены различия в интервале от предъявления слайда до начала вербального отчета, что соответствует активации материала памяти по разным предметам и разного возраста. Конфигурации потенциалов были индивидуальны, что, по-видимому, связано с историей жизни (опытом/знаниями) каждого испытуемого, однако выявились следующие закономерности: у всех испытуемых потенциалы на слайды 5-го класса в обеих задачах

были более негативны, чем на слайды 9-го, причем максимальное различие наблюдалось в лобных областях. Потенциалы на слайды 7-го класса занимали промежуточное положение. Полученные результаты свидетельствуют о том, что знания, приобретенные в разном возрасте, требуют специализации разного количества нейронов, а знания из разных дисциплин представлены разным числом нейронов в разных областях мозга.

Таким образом, разные показатели активности мозга, регистрируемые разными методами, отражают разную степень актуализации разных элементов опыта в области регистрации, возникающую при решении субъектом тех или иных задач, при том, что элементы опыта разных доменов и разного возраста представлены разным количеством нейронов в разных областях мозга. Выяснение нейрональных основ когнитивных процессов является, по сути, выяснением отношений между элементами опыта/знания.

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МОЛОДЫЕ ДОКТОРА РАН: МОДЕЛЬ ВЫСОКИХ ДОСТИЖЕНИЙ В СОВРЕМЕННОЙ КОГНИТИВНОЙ НАУКЕ

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Проблема реализации интеллектуального и творческого потенциала является одной из ведущих в современной науке (Friedman 2005; Gelade 2008), так как продуктивное применение человеком его способностей в той или иной области – это «краеугольный камень» развития многих сфер общества. Современная когнитивная наука является в этой связи наиболее экологически валидной деятельностью, результаты которой в полной мере отражают эффективную реализацию когнитивных ресурсов человека. При этом большинство современных научных исследований являются лабораторными. В данной работе в фокусе внимания находится изучение научной деятельности самих ученых как результата продуктивной «инвестиции» их когнитивных ресурсов в науку.

Цель данного исследования – определить основные индикаторы высоких научных достижений ученых и на их основе построить модель научных достижений в современной науке.

Для реализации поставленной цели исследование проводилось на специально отобранной для этого выборке – ее составили ученые из разных областей научных знаний, обладающие достаточно высоким уровнем научной продуктивности. Высокая научная продуктивность определялась рядом критериев – ранней защитой докторской диссертации (в возрасте до 45 лет), работой в одном из институтов РАН, выдвижением на конкурс в получении гранта Регионального общественного фонда содействия отечественной науке ученым советом института. Итоговая выборка тех ученых, кто дал согласие на участие в исследовании, составила 170 докторов наук в возрасте от 34 до 56 лет ($M = 48$ лет; $SD = 4.6$): из них 144 мужчины и 26 женщин.

Процедура исследования заключалась в следующем. Каждому ученому был отправлен опросник, включавший в себя несколько типов

Конфирматорная модель достижений российских ученых в современной когнитивной науке

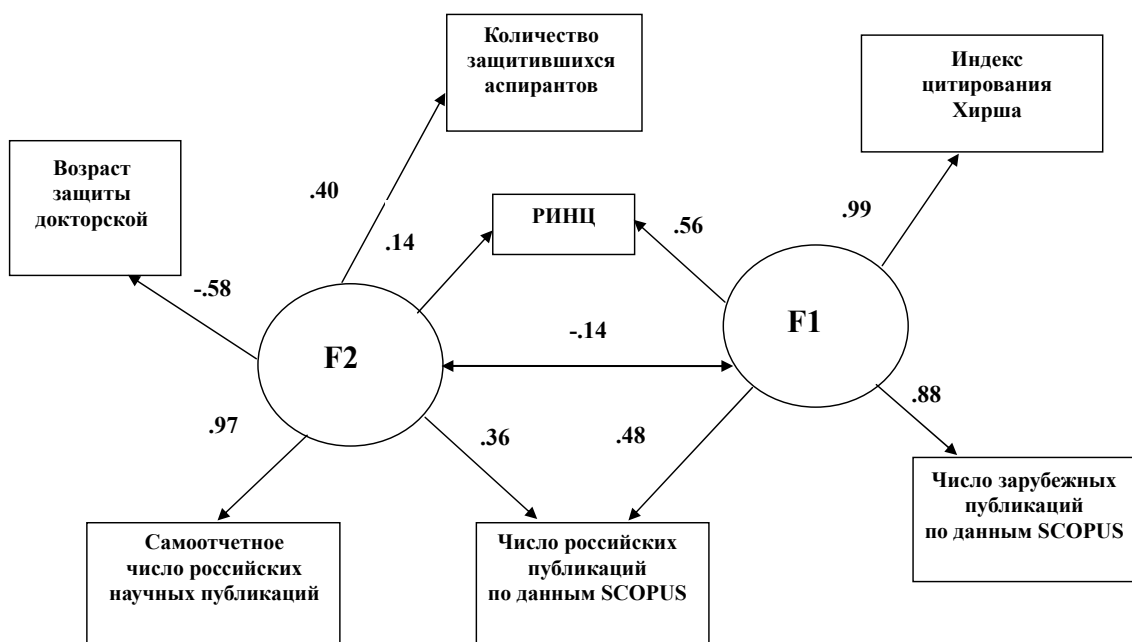


Рис. 1. Параметры соответствия модели эмпирическим данным: $\chi^2 (11, N = 170) = 15,664$; $p = .154$; $GFI = .973$; $AGFI = .931$; $CFI = .990$; $RMSEA = .050$.

вопросов относительно условий их семейного воспитания, обучения и профессиональной деятельности. Кроме того, ученые опрашивались на предмет их научных достижений – количестве публикаций в русскоязычных и англоязычных научных журналах; количестве аспирантов, защитивших диссертации под их руководством; возрасте защиты докторской диссертации. Это количество научных публикаций оценивалось как «самоотчетный показатель научной продуктивности ученых».

Помимо самоотчетных данных о публикациях, для каждого ученого были получены показатели по их российским и зарубежным научным публикациям из двух информационных порталов в области науки: зарубежного научного портала SCOPUS (scopus.com) и российского научного портала на сайте elibrary.ru. Это количество научных публикаций оценивалось как «объективный показатель научной продуктивности ученых». В дополнение к публикациям на основе материала баз данных научных порталов была собрана информация об индексах научного цитирования каждого ученого: зарубежном индексе (индексе цитирования Хирша) и российском индексе научного цитирования (РИНЦ).

Все собранные данные – самоотчетное число российских и зарубежных научных публикаций; число российских и зарубежных научных публикаций согласно базам данных научных порталов; данные об индексах научного цитирования; а

также возраст защиты докторской диссертации и количество защитившихся аспирантов – анализировались как основные индикаторы научных достижений ученых и использовались в дальнейшем анализе для составления модели продуктивности ученых в современной науке.

Для построения данной модели был применен метод линейно-структурного моделирования, осуществленный в статистической программе AMOS 16. Построенная конфирматорная двухфакторная модель (рис. 1) имеет хорошие показатели соответствия эмпирическим данным и представляет собой результат реализации интеллектуального и творческого потенциала молодых российских ученых в современной науке.

Результаты, которые демонстрирует модель, касаются двух принципиальных вещей – существования и связи двух латентных факторов, с одной стороны, роли индикаторов научной продуктивности, с другой стороны. Обратимся сначала к рассмотрению первого аспекта. Наиболее важный результат проведенного моделирования связан с демонстрацией двух факторов в структуре продуктивности исследуемой выборки. Модель показывает, что продуктивность ученых из проанализированной выборки в сфере российской науки не только не связана положительно с продуктивностью в международной сфере, но даже связана с ней слабо отрицательно ($\beta = -.14$, $p = .09$). То есть, у выборки можно констатировать некоторую, хотя далеко не абсолютную,

альтернативность в научной активности, направленной на отечественное (внутреннее) и зарубежное (внешнее) научное использование.

Другой важный аспект касается роли научных индикаторов, представленных в модели. Прежде всего, особого внимания заслуживает присутствие в модели индикатора «возраст защиты докторской диссертации», который нагружен по фактору, связанному с российской научной продуктивностью. Значимый отрицательный показатель этой нагрузки ($\beta = -.58$, $p = .000$) свидетельствует о том, что ранний возраст защиты докторской является показателем достижений ученых в российской науке, но не в зарубежной. Данный результат подчеркивает важность интенсивного накопления научных достижений в российской науке. Кроме этого показателя, отдельного анализа заслуживают те индикаторы, которые нагружены по каждому из двух латентных факторов. Практически все зарубежные научные индикаторы нагружены по латентному фактору, связанному с продуктивностью ученых в зарубежной науке, а некоторые из них нагружены также и по фактору, связанному с российской продуктивностью. В то же время ряд российских научных индикаторов в модели не представлен вообще по причине ухудшения ее соответствия эмпирическим данным. Такие

результаты позволяют отдельно обсуждать проблему валидности тех методов оценки научной продуктивности в российской науке, которые имеются на данный момент.

Главным результатом исследования является построенная модель достижений молодых российских ученых в науке на основе собранных индикаторов их научной продуктивности. Данная модель отражает современный профессиональный путь становления российских ученых в науке. Этот путь предполагает несколько, а точнее два, направления реализации научной деятельности: зарубежное и российское. В зависимости от того, какой путь выбран ученым, его интеллектуальные и творческие ресурсы инвестируются либо в зарубежную, либо в российскую науку. Причем достижения в зарубежной науке не повышают или же даже несколько уменьшают вероятность достижений в российской науке, как и наоборот.

Результаты данного исследования демонстрируют структуру научной продуктивности, а также те значимые научные индикаторы, которые определяют эту структуру и способствуют формированию ведущего интеллектуального потенциала страны, важного для ее технологических достижений (Suarez-Villa, 2000; Park, Lubinski, Benbow, 2007; Stewart, 2001).

ВЛИЯНИЕ КОГНИТИВНЫХ СТИЛЕЙ НА ФОРМИРОВАНИЕ ОНТОЛОГИЙ

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Задача данного исследования состояла в выявлении влияния индивидуальных когнитивных стилей на формирование категорий и создание из них иерархических структур. Фактически это исследование взаимосвязей между когнитивным стилем эксперта и построенными им онтологиями или концептуальными иерархическими моделями предметных областей.

Когнитивные стили и инженерия знаний

Идея исследования влияния когнитивного стиля на такую прикладную область, как инженерия знаний, сама по себе нова. Существующие на данный момент исследования в области

влияния когнитивных стилей на различные аспекты человеческой деятельности относятся к области либо педагогики, либо медицины. Прикладных исследований, изучающих влияние когнитивных стилей на профессиональную деятельность (в частности, аналитиков в каких-либо областях), всего несколько — и те занимаются вопросами восприятия информации, обучения и управления в организации.

Кроме того, большинство упомянутых выше исследований производилось за границей и не рассматривалось в России. Иными словами, данная работа является новым исследованием на стыке двух дисциплин — психологии и инженерии знаний. Подобные исследования ни в России, ни за рубежом ранее практически не проводились.

В научной литературе по когнитивной психологии (Холодная 2004) можно встретить более 20 психологических характеристик, которые относятся к когнитивным стилям. Основу феноменологии стилевого подхода составляют следующие

когнитивные стили: (1) полезависимость/полenezависимость; (2) узкий/широкий диапазон эквивалентности; (3) узость/широта категории; (4) ригидный/познавательный контроль; (5) толерантность/нетолерантность к нереалистичному опыту; (6) фокусирующий/сканирующий контроль; (7) сглаживание/заострение; (8) импульсивность/рефлексивность; (9) конкретная/абстрактная концептуализация; (10) когнитивная простота/сложность.

На первом этапе в проекте были использованы три из них: полезависимость/полenezависимость, узость/широта категории, импульсивность/рефлексивность. При выборе стилей авторы руководствовались следующими критериями: наличие изученных методик тестирования; простота реализации процесса тестирования; гипотезы о влиянии того или иного стиля на процесс категоризации у индивида.

В общем виде структура онтологии представляет собой набор элементов: понятия, отношения, аксиомы, отдельные экземпляры. Самым распространенным типом отношений, использующимся во всех онтологиях, является отношение категоризации, то есть отнесение к определенной категории. В результате работы над проектом впервые была выявлена взаимосвязь когнитивного стиля индивида с его способностью к категоризации.

Процесс категоризации рассматривался на примере визуального построения онтологий – концептуальных моделей предметных областей. Так как в роли испытуемых выступали студенты, изучающие инженерию знаний и интеллектуальные системы, то в качестве предметной области была выбрана «Информатика». Каждый студент строил свою онтологию понятия «Информатика» в системе Protégé. Protégé – это свободно-распространяемый редактор онтологий и фреймворк для построения баз знаний.

Полученные результаты

Полученные на этапе тестирования результаты были подвергнуты первичной обработке. Для собранных в таблицу данных построена корреляционная матрица, диаграммы рассеяния (для переменных с абсолютным значением коэффициента корреляции $> 0,7$) и проводится факторный анализ (анализ главных компонент). Полный анализ будет проведен на следующих этапах проекта, так как эксперименты продолжаются до конца декабря 2011.

Предварительный анализ полученных данных выявил значимую корреляцию между метрикой ширины онтологий и когнитивным стилем «Широта/узость категорий». Анализ главных компонент позволит выделить набор

главных факторов. Для определения, сколько факторов «оставлять», будет использован критерий Кайзера (или критерий каменной осыпи).

Таким образом, на основе проведенного исследования можно сделать выводы, что некоторые выбранные характеристики когнитивного стиля значимо влияют на то, какие онтологии строит индивид. Так, онтологии испытуемых с узкой категоризацией «растут» в ширину, в то время как индивиды с широкими категориями строят онтологии с большим числом уровней. При коллективном построении онтологий и попадании в группу «узких» категоризаторов полученная онтология окажется несбалансированной и потребует дальнейшей переработки, поэтому рекомендуется уравновесить такую группу «широким» категоризатором.

По предварительным оценкам, когнитивный стиль «Импульсивность/рефлексивность» не оказывает значимого влияния на качество построенных онтологий. Признак «Полезависимость/полenezависимость» значимо коррелирует с формой онтологии, таким образом, онтологии, построенные полenezависимыми индивидами, имеют более простую и понятную структуру, лишены ненужных связей и второстепенных деталей, т. е. полenezависимые – в целом хорошие онтологиисты и при коллективном построении онтологий включение такого человека в группу крайне желательно.

Результаты проведенного исследования говорят о перспективности данного направления, но использование результатов ограничено, в частности, тем, что была рассмотрена только малая часть когнитивных стилей. Следующим шагом может стать изучение связи со стилями «Узкий/широкий диапазон эквивалентности», «Конкретная/абстрактная концептуализация» и выработка методологии построения онтологий в группе в зависимости от когнитивных стилей ее участников.

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ЛЕКСИКО-ГРАМАТИЧЕСКОЕ РАЗВИТИЕ РЕБЕНКА РАННЕГО ВОЗРАСТА: ЛОНГИТЮДНОЕ ИССЛЕДОВАНИЕ

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Исследование выполнено в рамках написания магистерской диссертации и основывается на методе лонгитюдного исследования речевого развития ребенка раннего возраста.

Работа посвящена изучению вопроса о взаимоотношении различных компонентов языковой способности ребенка, что в настоящее время является актуальным для онтолингвистики, а также малоисследованным в России и за рубежом. В работе рассматриваются закономерности освоения русскоязычным ребёнком в возрасте от 8 до 30 месяцев падежного маркирования в сопоставлении с лексическим и синтаксическим развитием на ранних этапах становления языковой системы; анализируется появление в речи падежного словоизменения на материале отдельных лексем на начальном этапе формирования грамматической системы; сопоставляется развитие её отдельных элементов. Исследование позволило получить новые, более точные сведения о процессе, этапах и индивидуальных особенностях усвоения русского языка как родного, в результате подробного разноаспектного исследования особенностей речевой стратегии информанта (появление в речи падежного словоизменения рассматривается на материале отдельных лексем). Знание разнообразных вариантов нормального языкового развития ребёнка раннего возраста (в первую очередь, о существовании в норме различных типов соотношения развития лексикона, морфологии и синтаксиса) способствует оптимизации методов речевой диагностики. Гипотеза данного исследования: предполагается существование различий в порядке, времени появления и количестве падежных форм у отдельных существительных, а также взаимозависимость времени появления в речи падежного маркирования, степени развития фразовой речи и активного лексикона, обусловленная наличием индивидуальных особенностей речевой стратегии ребёнка. Анализируется материал дневника и аудиозаписей речи одного русскоязычного ребёнка, мальчика (2000 г.р.), проведённых автором исследования (дневниковые записи производились ежедневно – в период 8–30 мес., аудиозапись: 1–2 раза в неделю с 18 до 30 мес.). Ребёнок воспитывался в домашних

условиях, в полной семье, не имел братьев и сестёр. Проанализировано 830 слов активного лексикона; из них 326 – существительных, 540 высказываний из двух и более компонентов; 350 – содержали формы косвенных падежей существительных, отличных от «исходной», зафиксированной ранее. Принципы анализа материала: В данной работе учитывались слова и фразы, которые были произнесены ребёнком самостоятельно, соответствовали ситуации и не повторялись в данный момент за взрослым. (Случаи явного цитирования и прямой имитации не рассматриваются). Высказывания, содержащие формы именительного падежа, по причине их сходства с «первоначальной» формой у русскоязычных детей (Воейкова 2011), а также омонимичные именительному формы косвенных падежей, учитывались только при подсчёте общего числа высказываний и не рассматривались при анализе падежных конструкций. Формы косвенных падежей считались появившимися (согласно критериям, указанным в литературе (Воейкова 2011; Цейтлин 2009; Гвоздев 1961)), если наблюдалось противопоставление, по крайней мере, двух вариантов и словоформа употреблялась ребёнком с несколькими разными глаголами. Отмечалось время (возраст – «год. мес. день») появления отдельных словоформ; высказываний «телеграфного» типа, в которых «замороженная» форма именительного падежа выполняет функции других падежей, а также высказываний, содержащих существительные в косвенных падежах. Отмечались последовательность и количество падежных форм для каждой лексемы, что сопоставлялось с числом слов в активном лексиконе и длиной высказывания (в котором была встречена словоформа; а также максимальной, зафиксированной в речи на данный момент). При анализе активного лексикона оценивалось время, скорость появления, количество новых слов (общее; существительных, прилагательных, глаголов). При анализе фразовой речи учитывалось число компонентов во фразе, дублирование высказываний (синонимичных вариантов оформления смысла в пределах текущей ситуации). Результаты. В работе рассматриваются в различных аспектах индивидуальные особенности речевой стратегии информанта – исследуется связь между появлением в речи ребенка падежных форм существительных, развитием фразовой речи и активного лексикона. Обнаружено, что разные лексемы не совпадают по времени появления

в речи падежного маркирования, последовательности и количеству у них падежных форм. Прослеживается связь усвоения падежа с актуальностью, «перцептивной выпуклостью» слова для ребёнка, его частотностью в инпуте, а также их фонологической оформленностью как существительных 1 или 2 скл. (мужского рода) и, на данном этапе – независимость от времени появления слова в активном лексиконе. Интересно также, что для каждого падежа нормативно беспредложные формы, появились раньше, чем нормативно предложные, несмотря на то, что тактика ребенка была различной: он мог употреблять предложные формы вообще без предлога или с протопредлогом. Определённые слова первоначально усваивались ребёнком в определённых наиболее употребительных формах. Выделяются отдельные группы, в соответствии с тем, форма какого падежа появилась в речи следом за «первоначальной». Также обнаруживаются лексико-семантические различия между разными группами и аналогии внутри групп, что свидетельствует в пользу принципа усвоения языка (Tomasello 2003), основанного на употреблении. Особенности развития данного ребенка является «трёхэтапное» появление в речи форм косвенных падежей; более быстрое развитие синтаксического компонента по сравнению с морфологическим. В работе подробно рассматривается период адаптации падежа, в течение которого сохраняется употребление формы «замороженного именительного» наряду с формой косвенного падежа. Зафиксирован следующий порядок развития отдельных компонентов языковой способности у ребенка: сначала, на фоне не очень большого лексикона, начал развиваться синтаксис – появились двусловные, а затем

многословные высказывания, что характерно для типичного развития детской речи. Затем возникли основные формы всех косвенных падежей сущ. в ед.ч. (в течение 3 мес. 11 дней), что совпало с периодом довольно длительного лексического взрыва. Существенной чертой детской речи периода от 0 до 30 мес. (Воейкова 2011) является употребление безглагольных конструкций, состоящих из правильно маркированных падежных форм, в данном случае, напротив, наблюдалось встраивание «вновь» появившихся падежных форм в словосочетания и фразы, безглагольные конструкции указанного типа зафиксированы не были. Процесс появления в речи исследуемого ребёнка флективного маркирования можно соотносить с фазами пре- и протоморфологии (см. Воейкова 2011). На этапе протоморфологии формальные противопоставления отсутствуют, лексемы употребляются в базовой форме (продолжительность не одинакова для разных лексем). Протоморфологическая стадия характеризуется появлением первых морфологических контрастов и минипарадигм. В то же время стремительно растёт количество слов в активном лексиконе и увеличивается длина высказывания. На ранних этапах освоения грамматики функциональные предпочтения, облегчающие коммуникацию, оказывались сильнее формальных предпочтений.

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ПОСЛЕДЕЙСТВИЕ СЛЕПОТЫ К ВЫБОРУ: ВОЗМОЖНО ЛИ РАЗЛИЧЕНИЕ ИСТИННЫХ И ЛОЖНЫХ ВОСПОМИНАНИЙ

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В последние десятилетия в когнитивной психологии памяти акцент исследований сместился на изучение соответствия между тем, что человек реально видел и помнил, и тем, что он сообщает. Отсюда – исследования ложных воспоминаний, слепоты к выбору и т.д. и связанные с этим исследования происходящих искажений воспоминаний (например, конфабуляций). В

экспериментах показано влияние предъявления ложных сведений (misinformation procedure) на изменение воспоминаний о ранее виденном событии (Loftus, Pickrell, 1995), при этом ошибочно узнаваемые стимулы обрабатываются столь же быстро и столь же уверенно, как и истинные. В исследованиях П. Йоханссона и др. (2006) утверждается, что люди не только забывают однажды виденное событие и в дальнейшем полагаются на чужую интерпретацию этого события, но и слепы к собственному выбору, не замечая его подмены, не осознавая, что обосновывают выбор, противоположный тому, который был

ими сделан. Тем не менее, исследования по имплицитной памяти позволяют предположить, что люди помнят, хотя и не эксплицируют, однажды виденную информацию. Это, в свою очередь, вызывает вопрос о том, можно ли обнаружить отличия между ложным и истинным воспоминанием. А также позволяет предположить, что лежащие в основе ошибочного воспоминания механизмы могут отличаться в зависимости от степени осознания предъявленной испытуемому дезинформации.

Цель настоящего исследования заключалась в попытке доказать возможность различения испытуемыми истинной и подтасованной информации. Для этого в эксперименте были совмещены две исследовательские парадигмы – ложных воспоминаний и слепоты к выбору. Одной группе испытуемых на первом этапе предлагалось совершить выбор из двух предъявленных альтернатив (всего 16 пар фотографий скаковых лошадей с инструкцией выбрать ту, которая более вероятно может выиграть скачки), а на втором – обосновать причины собственного выбора. На втором этапе предъявлялась лишь одна альтернатива (либо соответствующая выбору испытуемого, либо противоположная), тем самым была затруднена возможность испытуемого обратиться к контексту, в рамках которого он совершал первоначальный выбор. Всего предъявлялось 8 фотографий. На третьем этапе мы просили испытуемого вспомнить первоначальный выбор, вновь предъявляя две альтернативы (все 16 пар). В данном случае у испытуемого была возможность вспомнить свой выбор, благодаря наличию второго варианта, с которым первоначально проводилось сравнение для принятия решения, или же – опереться на информацию, предъявленную во второй серии.

Для ответа на вопрос, способны ли испытуемые вспомнить, какой выбор они совершили, т.е. совершают ли они ложные обоснования в силу того, что не помнят, какой выбор совершали, вторая группа перед началом второй серии получала инструкцию указать, считают ли они предъявленную фотографию своим выбором или подтасованным. Фиксировалось, ведут ли в этом случае ошибки узнавания, совершенные на второй стадии, к закреплению их при последующем тестировании.

Для ответа на вопрос о том, как осуществляется коррекция ответов в случае метакогнитивной инструкции, третью группу испытуемых после второй серии информировали, что все предъявленные им для обоснования фотографии были подтасовками. На самом деле такая

инструкция была истинной лишь отчасти (так как лишь 4 из предъявленных для обоснования выборов были подтасовкой).

Были получены следующие результаты.

В контрольных замерах (в отсутствие второй серии, в эксперименте № 2 и 3) испытуемые повторяют свой выбор в 70% случаев. Если испытуемых не предупреждают о подтасовках (первая группа), в случае предъявления для обоснования выбора, адекватного сделанному ранее, испытуемые повторяют свой ответ в 87% случаев, в случае предъявления и обоснования подтасовки испытуемые повторяют свой первоначальный выбор лишь в 35% случаев. Все указанные различия являются статистически значимыми ($p < 0,05$). Проведя сопоставление с полученными данными и контрольными замерами, был сделан вывод, что реакция на подтасовку объясняет около 35% изменений своих ответов в сторону подтасованного варианта (Гершкович, 2011).

Результаты также показали, что в 95% случаев испытуемые не замечали подтасовки и обосновывали предложенную альтернативу, тогда как при инструкции идентифицировать подтасовку они совершали лишь 35% ошибок. Т.е. испытуемые способны при предупреждении их о возможной подтасовке правильно идентифицировать ложную информацию. Мы проанализировали ошибочные ответы, которые испытуемые давали во второй серии, и оценили их последствие на воспоминание о собственном выборе в третьей серии (см таблицу).

	ошибочная идентификация подтасованных вариантов как своих собственных	ошибочное принятие своих собственных ответов за подтасованные
Повтор своего ответа	56 %	73 %
Смена своего ответа	44 %	27 %

Показано, что к своему собственному выбору испытуемые возвращаются чаще, даже если ошибочно посчитали его подтасовкой, но вот если они подтасованный вариант ошибочно идентифицировали как свой собственный, то в дальнейшем с большей вероятностью закрепят свою ошибку. Это, в свою очередь, может свидетельствовать о различении своих собственных и подтасованных вариантов, даже в отсутствие экспликации этого различия. Таким образом, повторное тестирование оказывает

парадоксальный эффект, с одной стороны, способствуя более точному узнаванию в случае правильных ответов, а с другой – закрепляя ложные воспоминания.

Также по-разному испытуемые корректируют свои ответы после предъявления информирования о том, что все обоснованные варианты были подтасовкой. После того, как испытуемые обосновали свой реально данный ответ, а им предъявили инструкцию с ложным информированием, они дают 66% повторов своих первоначальных ответов в сравнение с 87%, которые они дают в отсутствие ложного информирования. Т.е. отказываются от своего исходного выбора примерно в 20% случаев ($p < 0,001$). В случае с подтасовкой испытуемые дают 69% повторов своих ответов в сравнение с 35%, даваемыми без метакогнитивной инструкции, т.е. исправляют 34% собственных ответов. Что значительно отличается от количества

исправлений, данных в отсутствие метакогнитивной инструкции ($p < 0,0001$), а также значительно отличается от количества исправлений ответов реально сделанных выборов ($p < 0,05$). Одно из возможных объяснений того, что испытуемые реже исправляют свои исходно данные ответы, чем подтасованные, заключается в том, что испытуемые больше доверяют информированию относительно подтасованных вариантов, а следовательно, различают свой собственный и подтасованный выборы.

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ФУНКЦИОНАЛЬНОЕ ИЗМЕНЕНИЕ МОЗГОВОГО КРОВООБРАЩЕНИЯ ВЛИЯЕТ НА ПРОЦЕССЫ НЕАССОЦИАТИВНОГО ОБУЧЕНИЯ У КРЫС

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Введение. Когнитивные нарушения, прежде всего изменения памяти и внимания, у пациентов с ранними формами хронической церебральной ишемии относят к психическим расстройствам, которые наиболее часто встречаются. Для изучения проявлений таких нарушений в эксперименте может служить модель исследования габитуации – вида неассоциативного обучения, состоящего не в приобретении новых поведенческих реакций, а в ослаблении во времени уже существующих.

Целью исследования было изучение процессов габитуации в тесте «открытое поле» (ОП) у белых лабораторных крыс, перенесших функциональное изменение мозгового кровообращения (ФИМК).

Методы исследования. Работа была выполнена на 60 белых беспородных лабораторных крысах-самцах, разделенных на две экспериментальные серии.

Первую экспериментальную серию составили 20 животных (группа «Опыт РЭГ»), у которых моделировали эпизод ФИМК путем создания антиортостатической гипокинезии под углом

45° в комбинации с укачиванием в течение 1 часа. Параметры церебральной гемодинамики у животных данной группы оценивали методом импедансной реоэнцефалографии (РЭГ) по следующей схеме (перед регистрацией животное предварительно наркотизировали тиопенталом натрия в дозе 50 мг/кг): первую регистрацию РЭГ осуществляли до моделирования ФИМК (формируя контрольные данные); вторую регистрацию РЭГ проводили сразу после создания ФИМК; третью – через сутки и четвертую – через трое суток после моделирования эпизода ФИМК.

Вторую экспериментальную серию составили 40 животных, разделенные на две группы, по 20 животных в каждой. Группу «Контроль ОП» составили бодрствующие животные, которые в течение 1 часа пребывали в рестрейнере на горизонтальной поверхности. Группу «Опыт ОП» составили бодрствующие животные, которым моделировали эпизод ФИМК аналогичным способом.

У животных второй экспериментальной серии оценивали поведенческие реакции в «ОП» в течение 15 минут (по видеозаписям эксперимента). Первую посадку в «ОП» животным группы «Контроль ОП» проводили сразу после извлечения из рестрейнера, а животным группы «Опыт ОП» – сразу после моделирования эпизода ФИМК; вторую посадку животным обеих групп проводили через три часа после первой;

третью – через сутки и четвертую – через трое суток после эпизода ФИМК.

Для оценки степени габитуации животных к условиям «ОП» использовали следующие поведенческие паттерны: суммарный уровень горизонтальной двигательной активности, уровень вертикальной двигательной активности (стойки с опорой на стенку, стойки без опоры на стенку), исследование отверстий (обнюхивание отверстий и заглядывание в отверстия).

Коэффициент габитуации (К_г) оценивали по формуле:

$$K_r = \frac{DA_2}{DA_1} * 100\%$$

где К_г – коэффициент, показывающий степень габитуации; DA₂ – суммарная активность по поведенческому паттерну, продемонстрированная животными за последние 5 минут теста; DA₁ – суммарная активность по поведенческому паттерну за первые 5 минут теста.

Статистическую оценку различий полученных результатов в группе «Опыт РЭГ» проводили при помощи парного t-критерия Стьюдента с поправкой Бонферрони (p_t), для оценки различий между группами «Контроль ОП» и «Опыт ОП» применяли U-критерий Манна-Уитни (pU).

Полученные результаты и их обсуждение. У животных первой экспериментальной серии сразу после моделирования эпизода ФИМК были зарегистрированы следующие изменения церебральной гемодинамики. Статистически значимо (p_t<0,05), по сравнению с контрольными данными, отмечалось увеличение амплитуды венозной компоненты, времени медленного

наполнения артериальной компоненты, скорости медленного и быстрого наполнения артериальной компоненты, реографического индекса, а также статистически значимое (p_t<0,05), по сравнению с контрольной группой данных, снижение таких показателей, как диастолический индекс и реографический коэффициент. Все вышеописанные показатели вернулись к своим первоначальным значениям и оставались на таковом уровне уже спустя три часа после моделирования эпизода ФИМК (по данным анализа РЭГ, зарегистрированных через три часа, сутки и трое суток после экспериментального воздействия). Это указывает на срыв компенсаторных реакций, направленных на поддержание адекватного кровоснабжения головного мозга, сразу после моделирования эпизода ФИМК, а возвращение показателей РЭГ к исходному уровню говорит о нормализации церебрального кровотока за счет механизмов ауторегуляции.

В ходе исследования второй экспериментальной серии животных показано, что у крыс с ФИМК происходит изменение ориентировочно-исследовательского поведения в «ОП». За период первой посадки общий К_г, оцененный у групп «Контроль ОП» и «Опыт ОП» был практически одинаков, однако за период второй посадки он статистически значимо (pU<0,05) был выше в группе «Опыт ОП» (рис. 1). За период третьей посадки общий К_г статистически значимо (pU<0,05) был выше в группе «Контроль ОП». За период четвертой посадки статистически значимых отличий выявлено не было, однако в группе «Контроль ОП» наблюдалась тенденция к снижению общего К_г. Вышеописанная

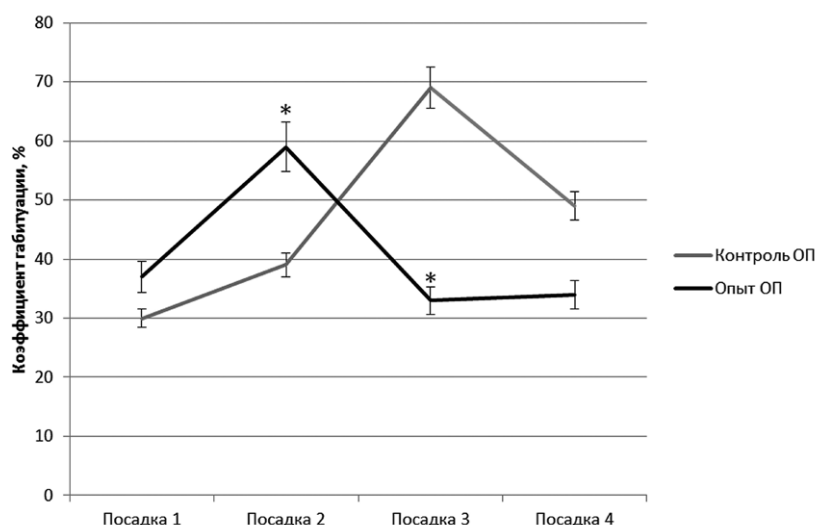


Рис.1. Динамика общего коэффициента габитуации. * – статистически значимые (pU<0,05) отличия от «Контроль ОП» за период посадки.

динамика Кг наблюдалась и для каждого из поведенческих паттернов по отдельности.

Выводы. У опытной группы животных возникает деза habituация к «ОП» спустя три часа после перенесенного эпизода ФИМК, тогда как мозговое кровообращение к этому моменту

времени у них полностью восстанавливается (по результатам РЭГ). У контрольной группы животных деза habituация к «ОП» возникает только через сутки. Таким образом, ФИМК изменяет процессы неассоциативного обучения у крыс.

ЗАВИСИМОСТЬ МЫСЛИТЕЛЬНОЙ ДЕЯТЕЛЬНОСТИ ЧЕЛОВЕКА ОТ УРОВНЯ АГРЕССИВНОЙ МОТИВАЦИИ

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Проблема влияния отдельных свойств личности, например, таких, как агрессивность, имеет важное значение в жизнедеятельности человека и до сих пор сохраняет свою актуальность.

Понятия «агрессия» и «агрессивность» охватывают весьма широкий круг переживаний, поведенческих явлений, мотиваций и когнитивных аспектов (Berkowitz, 1981; Лоренц, 1994; Бэрон, Ричардсон, 1997; Змановская, 2006), влияя несомненно на мыслительную функциональность человека.

Под агрессивностью понимают свойство личности, характеризующееся готовностью к совершению агрессивных действий, наличием деструктивных диспозиций, проявляющихся в виде побуждений, намерений, установок, а также способов реализации агрессивного поведения. Идея о влиянии агрессивности на познавательные процессы была высказана Зиллманном (Zillmann, 1984), где он предположил, что при высоком уровне агрессивного побуждения происходит дезинтеграция когнитивных процессов, снижающая адекватность когнитивных оценок ситуации, особенно тех, которые могут воспрепятствовать разворачиванию агрессии в поведении.

Таким образом, целью исследования стало выявление наличия и характера искажений в мыслительной деятельности у лиц с различным уровнем мотивации агрессии. Мы предполагали, что у испытуемых с неадекватным (высоким) уровнем агрессивности будут наблюдаться частые и грубые формы изменения течения и результата мыслительного процесса.

Методы и проведение исследования. В исследовании приняли участие 175 испытуемых мужского пола в возрасте от 12 до 25 лет (школьники и студенты Москвы). В качестве тестового

материала взяты методика А. Басса и А. Дарки «Диагностика показателей склонности и форм агрессии». Для исследования показателей мыслительной деятельности применялись следующие методики: модифицированная методика «Толкование пословиц», модифицированная методика «Пиктограмма» (Арестова, 2007). Все участники исследования были условно здоровыми и не находились на учете по медицинским показателям. Часть школьников была на внутришкольном учете по отклонению поведения.

Процедура исследования. Испытуемому предъявлялся специальный набор стимулов как в методике «Пиктограмма», так и в методике «Толкование пословиц». Одни из стимулов были по смыслу связанными с тематикой агрессии, другие были нейтральными. Стимулы были предъявлены в смешанном порядке.

Отметим условный характер деления пословиц на нейтральные и аффектогенные, а также непрямой, косвенный характер некоторых из стимулов, что делалось для выявления более грубых искажений, возможно, захватывающих и нейтральный материал.

Результаты исследования и их обсуждение. После проведения психодиагностики по тесту А. Басса и А. Дарки испытуемые были разделены на три группы по уровню выраженности агрессивности: группа с низким (47 человек), группа с средним (79 человек) и группа с высоким уровнем агрессивности (49 человек).

Различия между группами средне- и высокоагрессивных испытуемых не имеют статистической значимости, зато различия в толкованиях нейтральных и аффектогенных для испытуемых с высоким уровнем агрессивности оказываются значимыми для всей группы испытуемых ($t = 2,74$; $a = 0,005$).

Полученные нами результаты показывают, что имеются статистически значимые различия между группами в показателях воспроизведения нейтральных стимулов ($t = 2,68$; $a = 0,002$). Было отмечено, что для низкоагрессивных и среднеагрессивных испытуемых различие в

эффективности воспроизведения нейтральных и аффектогенных стимулов оказалось значимым, а для высокоагрессивных – нейтральные и аффектогенные стимулы искажались одинаково ($t = 2,48$; $a = 0,002$).

Средние значения искажений по методике в целом для среднеагрессивных испытуемых составили 2,47, а для высокоагрессивных испытуемых – 3,85, разница значимости составила $a = 0,01$.

Важно также отметить, что в группе высокоагрессивных испытуемых наблюдались открыто агрессивные толкования, не свойственные группе со средним уровнем и низким уровнем агрессивности. Основным видом искажений в обеих группах (средне и высокоагрессивных) является смысловое искажение, при котором изменяется не способ толкования пословицы, а подтекст. Часто наблюдался процесс извращения понятия, подмены смысла пословицы на прямо противоположный.

Проведенный анализ результатов выполнения методики «Пиктограмма» в этих выборках дает сходную картину. Основным результатом является тот факт, что при достаточно хороших мнемических способностях (выявляется в результате отборочного психо-физиологического исследования) у испытуемых возникает необъяснимое с точки зрения особенностей собственно памяти нарушение воспроизведения, особенно явственное при запоминании зондовых стимулов. Этот результат говорит о неоднородности влияния высокого уровня агрессивности на различные познавательные процессы – можно предположить, что память менее подвержена влиянию агрессивных тенденций, чем, например, понятийное мышление.

Анализ рисунков для методики «Пиктограмма», выполненных испытуемыми в трех группах, показывает, что в группе высокоагрессивных испытуемых более характерными являются рисунки, выполненные со значительным нажимом, избыточные штриховками и зачеркиваниями, а также изображение аффективно насыщенных ситуаций. Довольно часто наблюдаются и отказы выполнить рисунок. Также высокоагрессивные испытуемые чаще демонстрируют случаи полного забывания стимула, что нехарактерно для среднеагрессивных испытуемых.

Выводы: 1. Агрессивность оказывает значимое влияние на мыслительную и мнемическую деятельность, которая связана с особенностями ее протекания и искажения. 2. Уровень искажающего влияния агрессивных тенденций на познавательные процессы находится в прямой зависимости от уровня агрессивности и часто наблюдается у лиц со средним и высоким значением агрессивности. 3. Более всего искажающему влиянию агрессивных тенденций подвержены процессы понятийного мышления, нежели мнемические процессы индивида.

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НЕОСОЗНАВАЕМОЕ РАСПОЗНАВАНИЕ ОШИБОК

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Исследование поддержано грантом РФФИ № 11-06-00287а. «Неосознанная регистрация ошибок при решении когнитивных задач».

Автор настоящего исследования исходит из позиций теоретической концепции В. М. Аллахвердова [Аллахвердов, 2000]. В ней принципиально не рассматриваются ограничения на деятельность человеческого мозга через введение теоретической идеализации «идеального мозга», способного к

переработке неограниченно больших объемов информации в рекордно малые промежутки времени.

Исследование происходило при помощи специально созданной для целей данного эксперимента Прокопенко Ю. С. и Каташевым А. А. программе по дизайну автора эксперимента.

Программа представляла собой два блока. В первом блоке испытуемый учился однозначно соотносить символы греческого алфавита с кнопками клавиатуры компьютера. (Для этих целей на используемые кнопки клавиатуры были наклеены стикеры, на которых был

нарисован символ греческого алфавита, определяющий такое соответствие). Тренировочная программа воспроизводила в случайном порядке все 24 буквы греческого алфавита, ожидая ответа испытуемого и сообщая ему *post factum* о том, верно или неверно был дан ответ. В случае хотя бы одного неверного ответа весь цикл из 24 букв повторялся. Задачей этого первого, «тренировочного» блока было приучение испытуемого к непривычному для него заданию, что позволило в дальнейшем отделить «случайные» от устойчивых ошибок. После трехкратного успешного, безошибочного воспроизведения всей серии считалось, что испытуемый прошел «тренировку».

Во второй серии испытуемый делал то же самое, но в более сложных условиях и без какой бы то ни было обратной связи о результатах своих действий. Испытуемым предлагалась серия из 240 символов (по 10 каждой греческой буквы), которые предъявлялись на 80 миллисекунд. Все символы были случайным образом распределены, последовательность предъявления не менялась от испытуемого к испытуемому. Для придания дополнительной сложности используемые символы греческого алфавита были при помощи использования специфического инструмента Adobe Photoshop «размыты». То есть испытуемый видел лишь мелькнувший перед ним на доли секунды образ, в отношении которого ему нужно было как можно скорее решить задачу опознания и соотнесения к классу.

Программа записывала время, потраченное на принятие решения, и его характер (правильное соотнесение символа с его «кодом» на клавиатуре или неправильное).

Исследование проходило индивидуально, время, в среднем затрачиваемое на одного участника, составляло 80 минут. После эксперимента всем испытуемым давалась обратная связь от экспериментатора, который сообщал о целях и задачах эксперимента и снимал психоэмоциональное напряжение.

В исследовании приняли добровольное участие 20 человек возрастом от 19 до 22 лет, учащиеся различных факультетов СПбГУ. Выборка была сбалансирована по полу.

Инструкция исследования: «Вам предстоит решать задачу соотнесения символа с его значением на клавиатуре, такую же, как в тренировочной программе. Символ будет предъявляться на очень короткое время и будет виден хуже. Задача идет одновременно на скорость и точность».

Полученные результаты подвергались обработке отдельно по каждому участнику.

Отдельным элементом являлся отдельный символ греческого алфавита. Данные по каждому символу собирались в отдельные графы, по каждой букве определялось количество правильных и неправильных ответов. Затем шло объединение в группы символов на основе количества неправильных ответов. Так как максимум допущенных ошибок составлял 4 ошибки на один символ, групп было 5. Соответственно время правильных ответов, с 1, с 2, с 3 и 4 ошибками.

Математическая обработка осуществлялась при помощи многофакторного дисперсионного анализа ANOVA по модели 20x5 (участник, группа), выполненного на программе SPSS 17.0. (лицензионный договор № 20090302–1).

Дисперсионный анализ показал значимое совместное влияние факторов «группы» (вид ошибки) и «участник» ($p < 0.01$) и отсутствия влияния этих факторов по отдельности ($p > 0.1$).

Это говорит о том, что, несмотря на то, что каждый участник делает свои собственные ошибки, когнитивное бессознательное каждого участника способно делать различие между правильными и неправильными ответами, и это находит свое отражение в скорости принятия решения.

То есть человек, при всем многообразии возможностей совершения ошибки, все же способен на некую мета-рефлексию по поводу своей эффективности.

В качестве одного из теоретических объяснений найденного эффекта можно привести отождествление времени принятия решения и субъективной уверенности, как это делается, например, Клаппом и Хинкли [Klapp, Hinkley 2002]. Полученный эффект отчасти подходит под теоретическую модель Барански и Петрусика [Baransky, Petrusic, 1998] и прямо полемизирует с теорией уверенности как стохастических блужданий авторства Одли [Audley, 1960]. Вместе с тем он наилучшим образом объясняется концептуальными положениями психологии.

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ПРОВЕРКА ГИПОТЕЗЫ СЕПИРА-УОРФА НА ПРИМЕРЕ РУССКО-УЗБЕКСКИХ БИЛИНГВОВ

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Гипотеза лингвокультурной относительности Сепира-Уорфа привлекает интерес ученых из многих областей социо-гуманитарного знания, давно выйдя за пределы области этнолингвистических исследований американской школы культурной антропологии, в которой первоначально была сформулирована [Сепир, 1993]. Ее притягательность для лингвистов, психологов, социологов, экономистов и антропологов заключается в том, что она дает ответ на один из главных вопросов, поставленных в классических работах К. Леви-Стросса, М. Коула, К. Гирца, — о том, каков механизм воздействия культуры на индивидуальные особенности и поведение [Лурье, 2005].

Мы предполагаем, что одной из функций языка является включение определенных паттернов поведения и взаимодействия со средой. Предполагается, что модели поведения, обусловленные культурой, в которой человек был воспитан, в большой степени определяют поступки человека. Таким образом, культуру можно рассматривать как дискурс [Slobin, 1996], который запускает определенные репертуары поведения, определенные программы действий [Мацумото, 2003], причем не достигающие уровня осознанности. Данное исследование посвящено выяснению этой проблемы на примере билингвов (русский и узбекский языки).

Цель исследования состояла в проверке гипотезы Сепира-Уорфа в частном виде: язык влияет на принятие решения у билингвальных людей в ситуации культурного когнитивного диссонанса [Фестингер, 1999].

Первым этапом проведения эксперимента стала разработка и апробирование специальной методики, фиксирующей культуру, модели поведения которой были использованы. В методику вошли пятнадцать бытовых ситуаций, построенных таким образом, что представители двух культур ответят ровно противоположным образом. В качестве примера приводим следующую ситуацию: «Молодой человек собирается жениться. Его невеста работает медсестрой в военном госпитале, где лечатся в основном мужчины. Разрешит ли он своей будущей жене работать в этом месте после свадьбы?». На этом этапе работы в двух контрольных группах,

состоящих из мужчин в возрасте от 30 до 55 лет, проходила апробация ситуаций, содержащих культурный когнитивный диссонанс. Первая группа состояла из 46 русских мужчин, не имеющих высшего образования и не имеющих опыта знакомства с восточной культурой. Во вторую контрольную группу вошли 42 узбека, практически не имеющие опыта взаимодействия с русской культурой, которым предъявлялись те же вопросы на литературном узбекском языке. Перевод ситуационного опросника шел по процедуре «обратного перевода» с участием экспертов-билингвов. В результате для дальнейшего исследования было отобрано 13 ситуаций: 10 основных и 3 контрольных, которые были выбраны для того, чтобы исключить выбросы, предполагая универсальность ответов респондентов разных культур.

Помимо ситуационного опросника, была составлена конвергентная методика, построенная на основе семантического дифференциала Ч. Осгуда, опирающаяся на менее осознаваемые аспекты мышления. Испытуемым предлагалось после каждой ситуации оценить ее с точки зрения главного действующего лица по дискретным шкалам, выделенным Ч. Осгудом в качестве основных шкал оценки: эмоций, силы и активности [Осгуд, 1972].

На экспериментальном этапе в качестве испытуемых в исследовании приняли участие 53 человека, являющихся билингвами: 25 в одной группе и 28 в другой. Первой группе участников ситуации предлагались на русском языке, второй группе — на узбекском языке. Обработка данных, полученных по ситуационному опроснику, проводилась методом сравнения групп, использовался критерий хи-квадрат; оценка ситуаций по шкалам СД обрабатывалась при помощи критерия Манна-Уитни.

При анализе результатов, полученных по шкале «активность», в которой оценивалась необходимость совершения активных действий героем ситуации, найдены статистически достоверные различия в шести из пятнадцати значимых ситуаций ($p < 0.01$). У респондентов, получивших стимульный материал на русском языке, во всех вопросах заметна тенденция к завышению, оценка ситуации, как побуждающей к активным действиям (все данные оценки лежат выше «4»). При этом сравнение результатов, полученных по конвергентной методике на экспериментальной и на контрольных выборках, не показало разницы между ответами. Значимые

различия наблюдаются на различных вопросах в контрольной и экспериментальной выборках. Соответственно, говорить о том, что влияние языка на принятие непосредственно самих решений опосредуется культурными установками, было бы слишком сильным утверждением.

По шкале «оценка эмоций» в семи из десяти значимых ситуаций между экспериментальными группами обнаружены значимые различия (в четырех ситуациях на уровне статистической значимости $p < 0.05$ и в трех – на уровне $p < 0.01$): испытуемые, отвечавшие на вопросы на русском языке, продемонстрировали тенденцию оценивать ситуации как вызывающие неприятные эмоции. Тогда как по шкале «активность» наблюдается противоположная картина: испытуемые, отвечавшие на русском языке, продемонстрировали тенденцию оценивать ситуацию как требующую активных действий (в четырех ситуациях из десяти, на уровне значимости от $p < 0.001$ до $p < 0.05$). Выраженные тенденции обнаружены только в ответах респондентов, получивших стимульный материал на русском языке. Ответы респондентов второй

экспериментальной группы, которая работала на узбекском языке, близки к нормальному распределению. Таким образом, в контексте русского языка испытуемые оценивали ситуации скорее как негативные и требующие деятельности, тогда как на узбекском языке те же ситуации воспринимались более ровно. Эти данные подтверждают основную гипотезу исследования.

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ЗАВИСИМОСТЬ КАЧЕСТВА ВОСПРИЯТИЯ СТЕРЕОИЗОБРАЖЕНИЙ И СТЕРЕОГРАММ ОТ УРОВНЯ ОБУЧЕНИЯ БИНОКУЛЯРНОЙ СИСТЕМЫ

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В современное время растёт тенденция к использованию людьми в бытовых целях приборов с возможностью просмотра трёхмерного изображения. Однако не все люди воспринимают стереоизображения, несмотря на хорошую остроту зрения. Неоднократно в телепрограммах и в прессе поднимался вопрос о неприятных ощущениях и даже головных болях при просмотре стереофильмов.

Одной из методик изучения формирования трёхмерного образа объекта является предъявление наблюдателю простых стереоизображений и сложных стереограмм с регистрацией времени от момента предъявления до момента проявления стереоощущения. Регистрация периода времени, требующегося для восприятия стереокартины, является первым шагом к пониманию роли обучения зрительной системы видеть стерео двумя глазами. За счет бинокулярной системы человек обладает способностью стереовосприятия (видеть пространство

и трёхмерность объектов в искусственных условиях).

Целью исследования было доказать зависимость времени нахождения объекта на стереоизображении от количества повторных просмотров, а также изучить зависимость времени нахождения объекта от уровня сложности стереоизображения.

В исследовании участвовали 30 человек, которым предлагалось просмотреть 3 стереоизображения и две стереограммы, на трёх из которых они должны были увидеть объём предмета и на двух из которых респонденты должны были увидеть скрытый объект. Время, за которое респондент начинал видеть объём, отмечалось электронным секундомером. Статистически достоверно было определение трёхмерности картины в среднем за 16,5 с. Минимальное время, за которое был найден трёхмерный объект, – 3 с, максимальное время – 130 с. В данном исследовании было статистически установлено, что время нахождения трёхмерной картины в стереоизображении достоверно уменьшалось при каждом последующем просмотре стереоизображений. Если средняя арифметическая

времени нахождения объёма при первом просмотре равна 16,5 с, то средняя арифметическая времени нахождения объёма при просмотре третьего стереоизображения равна 14,5 с. Однако при увеличении сложности стереоизображений (испытуемым предлагалось увидеть скрытый объект) также увеличивалось время нахождения объекта. При подсчёте средняя арифметическая времени нахождения объекта была равна 24,45 с. Минимальное время нахождения объекта на стереоизображении – 3 секунды, максимальное время – 110 с. При просмотре следующего стереоизображения, на котором требовалось найти скрытый объект, – 22,25 с.

Эксперименты со стереоизображениями и стереограммами (стереокартины, не имеющие выраженных контуров объекта) подтверждают наше представление о том, что, чтобы увидеть сложную стереограмму впервые, тратится значительно больше времени, чем при повторном просмотре. Для восприятия таких стереограмм необходимо развитое ассоциативное стереомышление, соответствующие центры мозга должны сопоставить выпуклые и вогнутые элементы стереообраза и построить целостную картину, несмотря на отсутствие контурного очертания объекта и его деталей. Способность видеть стереограммы существует благодаря сенсомоторной интеграции и бинокулярному синтезу. Таким образом, мы наблюдаем обучение бинокулярной системы при восприятии трехмерных объектов. Следовательно, в ЦНС в структурах зрительной памяти хранятся (образно говоря) эталоны, которые позволяют быстро идентифицировать величину диспаратности при соответствующем положении зрительных осей, т.е. при определенном угле вергенции.

Известно, что одним из факторов восприятия трехмерности объектов зрительной сцены в естественных и искусственных условиях является корреспонденция и диспаратность в пределах «зоны Панума».

Данное исследование доказывает, что диспаратность «зоны Панума» не единственный информационный признак стереовосприятия, и еще раз подтверждает, что «зона Панума» представляет собой избирательное динамическое объединение функциональных структур и элементов различных уровней нервной системы для обеспечения полезного результата для жизнедеятельности человека и животных.

Вероятно, именно в результате функциональной кооперации нескольких компонентов сенсорных и моторной систем происходит формирование «зоны Панума». Кроме того, состояние «зоны Панума» обусловлено динамически организованным взаимодействием нескольких уровней бинокулярной системы: структурами, принимающими зрительные сигналы, структурами управления всеми элементами движений глаз и в том числе вергентными движениями глаз, а также структурами, обеспечивающими обратную афферентацию, структурами обработки полученных сигналов и структурами памяти. «Зона Панума», как системно организованное функциональное звено, необходима в восприятии пространства трехмерности реальных объектов и стереоизображений в искусственных условиях.

Процесс восприятия пространства – это процесс обучения зрительной системы. Процесс восприятия трехмерности объектов и стереовосприятия включает в себя также накопление в памяти всех сведений с анализом афферентных и эфферентных информационных потоков и с последующим синтезом.

И.М. Сеченов (1956): «Когда же искусство смотрения приобретено, оно дает ребенку множество форм передвижения глаз, заученных в связи с местом возбуждения сетчатки. Под руководством упражненного мышечного чувства развивается мало-помалу самостоятельное чувство местности». «Построение пространственного восприятия требует синтеза, обобщения опыта совместной работы глазодвигательной системы и системы зрения».

А.А. Ухтомский (1954): «В зрительной рецепции предметов человек руководится, прежде всего, проекцией сетчаткового образа на кору полушарий, и затем теми связями, которые входят в кортикальный образ, по мере его формирования, со стороны одновременных рецепций слухового, вестибулярного, тактильного и проприоцептивного аппаратов. Окончательный зрительный образ есть плод разнообразной практической корреляции и проверки».

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ВЛИЯНИЕ ПРОИЗВОЛЬНОЙ РЕГУЛЯЦИИ ФУНКЦИОНАЛЬНОГО СОСТОЯНИЯ (РЕЛАКСАЦИЯ) НА ОРГАНИЗАЦИЮ КОРКОВЫХ ПРОЦЕССОВ У ШКОЛЬНИКОВ 9–10 ЛЕТ

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Исследование проведено на 32 младших школьниках 9–10 лет. Электрофизиологический эксперимент включал четыре экспериментальные ситуации. Первая – состояние спокойного бодрствования (длительность 2 мин.), вторая – мнестическая деятельность (задание на запоминание слов), третья – состояние релаксации (длительность 7 мин.), четвертая – повторно мнестическая деятельность на пострелаксационном фоне. ЭЭГ регистрировали монополярно в затылочных (O1, O2), теменных (P3, P4), височно-теменно-затылочных (T5, T6), центральных (C3, C4) и лобных (F3, F4) отведениях. Анализировали низкочастотный диапазон 6–7 гц и альфа-полосу ЭЭГ 7–13 гц, в которой выделяли три субдиапазона: низко- (7–9 гц), средне- (9–11 гц) и высокочастотный (11–13 гц).

По результатам анализа выполнения задания на запоминание слов до и после релаксации у большинства испытуемых отмечено повышение эффективности мнестической деятельности: выявлено увеличение объема кратковременной слухоречевой памяти после релаксационного «сеанса». По группе в целом значимое увеличение среднegrupпового показателя составило с $4,25 \pm 0,11$ слов до релаксации до $4,74 \pm 0,12$ ($P < 0,01$) после. Релаксационный эффект улучшения кратковременной памяти характеризовался выраженными индивидуальными различиями: пострелаксационное увеличение ее объема варьировало от 0 до 0,9 слов. Это дало возможность выделить группы с различной выраженностью релаксационного эффекта. Были отобраны 25% детей с выраженным приростом объема памяти (0,8 и более слов) после релаксации и 25% детей со слабыми сдвигами (0,2 и менее слов). Далее для выделенных групп был проведен сравнительный анализ динамики ЭЭГ-параметров (спектральная плотность мощности и показатели когерентности в исследуемых диапазонах). Сравнительный анализ релаксационной динамики спектральных параметров выявил, что в обеих группах в ситуациях мнестической деятельности как до, так и после релаксации амплитуда ритмических составляющих альфа-полосы относительно фона была более низкой. Сдвиги носили или симметричный характер,

или преимущественно правополушарный. Это снижение было более выраженным в задних областях, в особенности в затылочных. В отличие от спектральных параметров, анализ изменений показателей когерентности при переходе от покоя к мнестической деятельности (до и после релаксации) позволил выявить существенные различия между выделенными группами. Хотя для обеих групп в ситуации мнестической деятельности отмечается повышение когерентности (функционального взаимодействия корковых областей), по внутриполушарным дистантным и межполушарным корковым связям выявляются и межгрупповые различия. Так, в группе со слабо выраженным релаксационным улучшением кратковременной памяти значимое повышение когерентности по дистантным связям при выполнении мнестической деятельности отмечалось в единичных случаях и только в среднечастотном субдиапазоне альфа-полосы, тогда как в группе с выраженным улучшением кратковременной памяти подобные изменения отмечались у большинства и во всех исследованных диапазонах.

В ситуации мнестической деятельности после релаксации в группе со слабым улучшением кратковременной памяти повышение когерентности (по отношению к первой ситуации «покой») отмечается уже во всех трех субдиапазонах альфа-полосы. В диапазоне 11–13 гц частота встречаемости по отдельным корковым связям достигает 40%. В группе с выраженным улучшением объема кратковременной памяти в ситуации мнестической деятельности после релаксации (как и до релаксации) значимые изменения когерентности по дистантным связям также отмечаются во всех исследованных диапазонах, а частота встречаемости сдвигов оказывается выше, чем до релаксации, в особенности в высокочастотном субдиапазоне альфа-полосы. Как показывает сравнительный межгрупповой анализ именно в этом частотном субдиапазоне (11–13 гц) межгрупповые различия оказываются наиболее выраженными: после релаксации по отдельным связям частота встречаемости значимого увеличения уровня когерентности в успешной группе достигает 80%. Таким образом, основные межгрупповые различия функциональных изменений при переходе от покоя к мнестической деятельности и при сравнительном анализе ситуаций прослушивания и удержания в памяти слуховых стимулов до и

после релаксации оказываются связанными с высокочастотным субдиапазоном альфа-полосы.

К настоящему времени нейрофизиологическое обеспечение когнитивных процессов достаточно хорошо изучено. Показано, что существенную роль в этом процессе играют регуляторные структуры, в особенности фронтальная кора. Последняя реализует свою управляющую функцию в тесном взаимодействии с другими корковыми зонами и подкорковыми областями. Современные анатомические и нейрофизиологические данные (Pribram, 1998) дают основание считать, что фронтальная кора осуществляет свою регулируемую роль через определенные структуры таламуса, ритмогенные структуры которого, получая информацию от фронтальных отделов, синхронизируют электрическую активность соответствующих текущей задаче корковых зон, облегчая их взаимодействие (Мачинская 2003). Согласно литературным данным, с высокочастотной ритмической составляющей альфа-полосы ЭЭГ связываются процессы избирательного торможения, тогда как динамика среднечастотной соотносится с процессами генерализованной активации (Osaka, 1984). В психофизиологическом плане имеющиеся в литературе данные позволяют соотнести высокочастотный альфа-ритм с когнитивными аспектами деятельности,

тогда как среднечастотный – с неспецифическими активационными процессами (Структурно-функциональная организация развивающегося мозга, 1990). Как показали результаты проведенного исследования, ЭЭГ-параметры именно высокочастотного альфа-диапазона оказались наиболее информативными в плане отражения различий в пострелаксационном повышении эффективности мнестической деятельности.

Принимая во внимание вышеизложенное можно предположить, что одним из механизмов позитивного влияния релаксации на когнитивные (в данном исследовании мнестические) процессы может быть повышение в пострелаксационном состоянии дифференцированности и избирательности корковых активационных процессов.

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ИДЕНТИФИКАЦИЯ РЕЧИ ДИКТОРОВ ПО РОДСТВЕННОМУ ПРИЗНАКУ

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В настоящее время актуальным является вопрос идентификации устной речи дикторов. Реалии современной жизни задают всё более новые, сложные задачи её распознавания. Были достигнуты серьезные результаты, в частности, в расшифровке речи специальными компьютерными программами и в переводе её в цифровой формат.

Несомненный интерес представляет анализ устной речи по ряду признаков: родственному, образовательному, географическому ареалу и др. В данной статье при помощи программы ИСФАР дан анализ сходства устной речи лиц, состоящих в родственных отношениях

Для достижения поставленной цели был проведён эксперимент. Его главной задачей явилась идентификация речи родственников. В эксперименте участвовали 16 дикторов, часть

из которых являются родственниками. В группе существуют 12 родственных связей.

Для записи устной речи был выбран сложный художественный текст – роман Стендаля «Красное и чёрное», начало которого каждый диктор читал в течение пяти минут. За это время предполагалось получить максимально возможный объём аллофонов. Далее, после записи речи, был произведён подбор параметров программы ИСФАР для получения оптимально точных результатов исследований. Затем была проведена сегментация. Данная программа (ИСФАР) содержит адаптивный алгоритм.

Главные параметры данного алгоритма указывают на то, что, несмотря на существующие различия в реализациях некоторой *r*-ой фонемы, все они воспринимаются человеком как нечто общее, иначе речь утратила бы свою информативность.

В ходе экспериментальных исследований были получены записи от следующих групп дикторов. Дикторы: Нестеров С. Л.,

Иванова П. Г., Вельдерман Е. С. привлечены к эксперименту для увеличения достоверности исследования.

Благодаря расчётам при помощи указанной программы было получено 240 таблиц рассогласований речевых единиц (фонем). В процессе анализа таблиц информационного рассогласования были выявлены минимальные значения между сходными фонемами. Из получившихся результатов была взята средняя медианная. В итоге была получена база информационного рассогласования по дикторам, которая была оформлена в виде таблицы минимальных рассогласований.

По минимальным рассогласованиям мы можем чётко выделить 11 из 12 распознанных родственных связей (выделенные значения), т.е. 92%. Приблизительной гранью опознавания близких родственников можно выделить те рассогласования, сумма которых меньше значения 1.76. Также данная таблица поможет в проведении иных исследований, например, по социальным и биологическим признакам. В связи с поставленной целью находим среднее отношение в речи между родственниками.

В проведённом эксперименте принимали участие две группы родственников: с одной стороны, родители и дети, с другой стороны, родные братья. Для сравнения с устной речью лиц, имеющих родственные связи, была использована группа № 5 (дикторы, не имеющие между собой родственных связей). Первая группа – рассогласования родителей с детьми, вторая группа – рассогласования между братьями. Среднее рассогласование между неродственниками 1.74, между родственниками среднее рассогласование 0.69; между родственниками и неродственниками – 1.65.

При нахождении среднего значения рассогласований получены следующие данные: в первой группе средние рассогласования – 0.747, во второй группе – 0.642. Тем самым можно сделать важный вывод: устной речью подтверждается генетическая составляющая того, что устная речь братьев более сходна, чем речь детей и родителей.

Приведённые тезисы являются лишь началом большой работы: в дальнейшем предполагается нахождение рассогласований по конкретным фонемам.

СИНХРОНИЗАЦИЯ ЭЛЕКТРИЧЕСКИХ ПРОЦЕССОВ И ОРГАНИЗАЦИЯ ПОВЕДЕНИЯ ПРОКАРИОТ

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Социальная жизнь общества – это деятельность субъектов, направленная на сохранение и развитие условий существования. Исследования показывают, что общественный образ жизни характерен не только для высокоорганизованных живых существ, но и для микроорганизмов, в частности, для прокариот (Олескин, 2009). Координированное поведение микроорганизмов проявляется в многообразных формах – они действуют совместно для выполнения разных задач, например, для коллективной агрессии, чтобы обеспечить доступ колонии к пищевым ресурсам. Одним из проявлений коллективного взаимодействия в микробных сообществах является формирование надорганизменных структур – образований, важных для его жизни как целого. В зависимости от конкретных условий прокариоты, например, цианобактерии,

изменяют вид своего сообщества, имеющего обычно форму пленки, создавая различные морфологически оформленные структуры. Их построение требует согласования совместной деятельности многих членов сообщества. Изучение механизмов, организующих постановку задачи, и роль электрических явлений как одного из формообразующих факторов в социальном процессе при решении общей для коллектива задачи выполнено в наших экспериментах на прокариотах – нитчатых цианобактериях.

Мы провели электрофизиологическое исследование активности цианобактерий на разных стадиях решения ими совместной задачи – создания единой пленки. Предварительные регистрации электрической активности от сообщества микроорганизмов показали, что для зрелой плёнки типичны осцилляции частотой 6–8 Гц и 28–33 Гц. Амплитуда колебаний не превышала 30 мВ. Уровень потенциала покоя (ПП) составлял –20 – –40 мВ в зависимости от места введения микроэлектрода (МЭ) в плёнку. Электрическая активность индивидуальной цианобактерии, зарегистрированная внутриклеточным МЭ, характеризуется стабильной по частоте и амплитуде

ритмикой, по крайней мере, в течение 1 ч. 45 мин. регистрации, амплитуда отдельных осцилляций достигает 50 мВ при уровне мембранного потенциала (МП) –45–50 мВ. Предполагалось, что суммарные электрические осцилляции зависят от совместной активности цианобактерий, которая различна по интенсивности в разных местах сообщества. Поскольку предыдущими экспериментами было выявлено, что сообщество обладает способностью к регенерации, которая осуществляется направленным движением групп нитей, пленка была травмирована – надорвана в нескольких местах, чтобы спровоцировать необходимую для эксперимента активность в конкретном месте и в конкретное время. Затем в течение нескольких дней регистрировали электрическую активность различных структурных образований, создаваемых цианобактериями в процессе «залечивания ран», т.е. при осуществлении этими микроорганизмами совместного действия для воссоздания целостности сообщества. Результаты показали, что сила и выраженность электрических осцилляций зависит от места регистрации: наиболее мощная синхронизированная высокоамплитудная активность характерна для областей интенсивного движения нитей, в которых сформировались структуры типа тяжей, выполняющие коммутирующую функцию между восстанавливающимися краями разрыва плёнки. В областях, где не происходит интенсивное образование новых структур, уровень электрической активности был чрезвычайно низким и характеризовался только наличием отрицательной разности потенциалов (от –20 до –40 мВ). Таким образом, опыты показали прямую связь между выраженностью синхронизированной электрической активности цианобактерий (которыми являются осцилляции) и уровнем деятельности по решению задачи восстановления целостности сообщества – чем мощнее электрические

осцилляции, тем выше интенсивность морфогенетических движений нитей.

Результаты экспериментов на людях показывают, что при взаимодействии участников во время решения задачи для достижения общей цели осцилляторная активность определенных областей мозга синхронизируется и ее всплески ассоциируются с действиями партнеров (Funane et al., 2011). Во время социального общения оба участника постоянно активны, подстраивая свои собственные усилия к изменениям действий партнера (Dumas et al., 2010). Эта общая активность по поводу достижения цели проходит на фоне синхронизированной активности определенных областей мозга каждого из участников. Роль синхронизации электрических процессов как одного из возможных механизмов координации активности клеточных ансамблей и способу динамического избирательного контроля за работой распределенных функционирующих клеточных ансамблей предполагалась и в исследовании Canolty et al., 2010. Индивидуальная эндогенная ритмика предсказывает возможность социальной интеграции индивидуума. Влияет ли окружающая среда на синхронизацию электрических процессов, является ли нормальность электрической активности нервной системы существенной для интеграции в социум? Это вопросы для будущих опытов.

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МОРФОЛОГИЧЕСКИЕ ОСНОВЫ АПРАКСИИ У БОЛЬНЫХ С ИНСУЛЬТОМ ПО ДАННЫМ НЕЙРОВИЗУАЛИЗАЦИИ

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Апраксия (А) – нарушение выполнения выученных произвольных движений, которое не может быть объяснено элементарным двигательным или чувствительным дефицитом или непониманием сути двигательной

задачи. А широко распространена у больных инсультом, однако церебральные основы этого расстройства изучены недостаточно. В классической неврологии происхождение А как одного из нарушений высших психических функций связывали с поражением коры головного мозга и ближайших подкорковых структур, однако после появления методов нейровизуализации эти представления изменились.

Целью работы явилось определение морфологических коррелятов различных видов апраксии у больных ишемическим инсультом.

Материалы и методы. Обследованы 84 больных в возрасте от 35 до 65 лет без первичного двигательного и сенсорного дефицита в руках в раннем восстановительном периоде ишемического инсульта. Всем больным проводилась клинико-неврологическое обследование, магнитно-резонансная томография (МРТ) головного мозга и такие пробы на А, как: «Воспроизведение позы кисти», «Воспроизведение и копирование положений руки экзаменатора», «Воспроизведение бессмысленных движений», «Использование воображаемых предметов или пантомима», «Рисование куба и стола», «Складывание геометрических фигур из спичек», проба «Кулак-ребро-ладонь», «Реальное использование предметов», «Сложные действия с последовательным использованием предметов», «Выполнение символических жестов». Результаты выполнения проб оценивались в баллах (Глозман 1999; Kimura, Archibald 1974). На основании результатов обследования диагностировалась кинетическая, кинестетическая, регуляторная и пространственная А (Лурия 1973). Анализ данных осуществлялся с помощью пакета программ «SPSS v.10.0».

Результаты. Тот или иной вид А выявлен у 76 из 84 (90,5%) больных. В большинстве случаев имелось сочетание двух и более видов А, преимущественно негрубо выраженной. В зависимости от наличия и характера сочетаний видов А все больные были разделены на семь групп. По данным МРТ головного мозга, у больных с А выявлялись постишемические изменения как в коре, так и в подкорковых структурах головного мозга, хотя для лиц с очагами корковой локализации (51 из 76 больных) превосходила долю лиц с поражением только лишь подкорковых образований (25 из 76 человек), $p=0,000$. Изолированная кинестетическая А в контралатеральной очагу инсульта руке (12 больных) при левополушарных очагах (8 из 12) встречалась чаще, чем при правополушарных (3 из 12), $p=0,051$ и билатеральных (1 из 12), $p=0,007$, очагах. Сочетание кинестетической А в контралатеральной очагу инсульта руке и зрительно-пространственной А при отсутствии либо наличии сопутствующей кинетической и регуляторной А (46 больных) отмечалось одинаково часто при правополушарных (17 из 46), левополушарных (16 из 46) и билатеральных (13 из 46) очагах. Однако анализ всей таблицы сопряженности вида апраксии в руке, контралатеральной стороне клинически значимого инсульта, и стороны локализации

выявленных на МРТ постишемических изменений не выявил статистически значимой связи между видами нарушения праксиса и стороной поражения головного мозга. Из показателей выполнения отдельных проб лишь для теста «Рисунок куба и стола» была выявлена значимая связь количественных результатов пробы со стороной поражения головного мозга: больные с левополушарными очагами выполняли задание лучше, чем с правополушарными ($p=0,012$) и двусторонними ($p=0,010$) изменениями.

Частота развития кинестетической А (изолированной или сочетающейся с другими видами А) при поражении зоны, включающей теменную, теменно-затылочную, теменно-височную и теменно-височно-затылочную области коры (38,2%) оказалась статистически значимо выше, чем при поражении зон, включающих лобно-теменную и лобно-теменно-височную области коры (16,2%) $p=0,005$; лобную, лобно-височную и височную области коры (8,8%), $p=0,0001$; затылочную кору (4,4%), $p=0,000$; и также выше, чем при изолированном очаговом поражении подкорковых структур (20,6%), $p=0,028$, и лейкоареозе (11,8%), $p=0,001$. У больных с пространственной А (изолированной или сочетающейся с другими видами апраксии) постишемические изменения в теменной и смежных с ней областях (в 37,3% случаев) выявлялись значимо чаще, чем в лобно-теменной и лобно-теменно-височной областях (17,6%), $p=0,028$, лобной, лобно-височной и височной областях (3,9%), $p=0,0001$, затылочной области, $p=0,0002$, и чаще, чем при лакунарных инфарктах и лейкоареозе при отсутствии крупноочаговых изменений (11,8%), $p=0,004$. В то же время, общий анализ двуходовой таблицы сопряженности характера апраксии (представленный семью категориями в зависимости от вида и сочетания видов А) с локализацией церебральных постишемических изменений (представленной тринадцатью категориями, в зависимости от зоны поражения головного мозга) не выявил наличия связи между этими параметрами. Из отдельных тестов на апраксию с зоной поражения головного мозга статистически значимо были связаны лишь результаты теста «Использование воображаемых предметов или пантомима», $p=0,004$.

Обсуждение. Полученные данные противоречат представлению о том, что конкретные виды А. развиваются лишь при поражении определенных зон головного мозга (Лурия 1973; Хомская 2003). Результаты исследования согласуются с мнением авторов, которые указывают на отсутствие строго специфических для разных видов А. областей церебральной деструкции,

более высокую частоту развития всех видов А при поражении лобных и теменных долей, а также возможность развития апраксии при поражении не только коры, но и глубинных подкорковых структур (Goldstein 2004).

Выводы. Апраксия может развиваться при ишемии как коры головного мозга, так и глубинных отделов его белого вещества и базальных ганглиев, хотя при поражении коры она возникает статистически значимо чаще. Кинестетическая апраксия у госпитализируемых больных с минимальным неврологическим дефицитом в раннем восстановительном периоде ишемического инсульта в контралатеральной стороне инсульта руке статистически значимо чаще отмечается при поражении левого полушария головного мозга. Частота возникновения пространственной, кинестетической и регуляторной апраксии со стороны поражения головного мозга статистически значимо не связана. Строго

специфических для развития отдельных видов апраксии зон ишемического повреждения головного мозга не обнаружено, хотя частота развития кинестетической и пространственной апраксии выше при ишемии теменной, теменно-затылочной, теменно-височной и теменно-височно-затылочной областей коры, чем при поражении других областей головного мозга.

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ЭМОЦИИ И ИХ МАТЕМАТИЧЕСКИЕ КОРРЕЛЯТЫ В СТИХАХ ПУШКИНА

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Теория. В докладе обсуждаются вопросы применения принципа «золотого сечения» и числовых последовательностей Фибоначчи к анализу поэтического текста. Тексты гениального русского поэта признаны гармоническим эталоном русского стиха, поэтому любые исследования таких текстов должны базироваться на методах общей гармонии систем. Гармонический анализ стихов Пушкина проводится автором на основе собственных концепции и метода эстетико-формального стиховедения. Это новое научное направление базируется на философско-феноменологических принципах гармонического саморазвития поэтической мысли, принципах, которые математически выражаются динамической формой закона «золотого сечения».

В своих работах мы используем представление о ритме стиха как о мере гармонической упорядоченности движения поэтической мысли, определяемой соотношением ударных и безударных слогов в русском поэтическом тексте. Соотношение это не абсолютно, а относительно, и измеряется оно как отклонение реального ритма от ритма гармонического. В свою очередь, гармонический ритм определяется пропорцией

«золотого сечения» в узловых (рифменных) точках стиха. Динамический принцип «золотого сечения» позволяет объединить в едином критерии *три* показателя, характеризующих стихотворный текст: ритм, рифму и строфику. Заметим, что подобными возможностями не обладает ни один из известных в науке методов исследования стихотворного текста.

Метод. В рамках гармонического (эстетико-формального) стиховедения операндами гармонической пропорции ритма являются: (а) величины S слогового объема текста, читаемого от его начала; (б) величины T тонического объема того же текста. Расчеты для каждого i -го рифменного узла (2-стишия, 4-стишия и др.) ведутся по трем силлабо-тоническим параметрам стиха, а именно по общему накопленному от начала текста числу слогов S_i («целое»), числу накопленных безударных слогов B_i («большее») и числу накопленных ударных слогов T_i («меньшее»):

$$\tau_i = 0,087 / \Delta z = 0,087 / (S_i / B_i - B_i / T_i), \quad (2)$$

где коэффициент 0,087 соответствует единичному уровню РГТ $\tau_0=1$. Для перехода от показателя гармонического ритма стиха τ_i к оценке психофизиологического восприятия поэтического текста используется известный в психолингвистике закон Вебера–Фехнера, который устанавливает логарифмическую зависимость

между силой внешнего воздействия и интенсивностью человеческих ощущений, возникающих в результате этих воздействий. Формула

$$PGT_i = O_i = 1 + \ln(\tau_i) \quad (3)$$

представляет собой динамическую (темпоральную) оценку ритмо-гармонического восприятия текста. Для измерения степени размаха показателя PGT используется относительный показатель экспрессивности ритмоощущений K_{Σ} , вычисляемый как скорость изменения величины O_i :

$$K_{\Sigma}(i) = (ABS(O_i - O_{i-1}) / (x_i - x_{i-1})) / K_0, \quad (4)$$

где разность $(x_i - x_{i-1})$ – расстояние (число строк) между двумя соседними узловыми рифменными точками стиха, ABS – абсолютная величина, а K_0 есть средний уровень $K_{\Sigma}=0,034$ для первой главы романа Пушкина «Евгений Онегин» (ЕО), принятый нами за единицу.

Параметры O_i и K_{Σ} позволяют, таким образом, рассматривать полученные результаты как *индикаторы психофизиологического процесса восприятия стиха*, а сами ритмодинамические модели стиха – изучать естественный, темпоральный ритмо-содержательный процесс восприятия разных по объему поэтических произведений, в том числе проводить сопоставительный анализ текстов разной строфической организации и разных стихотворных размеров.

Применительно к экспрессивно-гармонической динамике ритма используются следующие интегральные параметры стиха: 1) средние для некоторого текста значения ритмико-гармонической точности PGT O_{cp} (наряду с максимальным значением O_{max}); 2) средние значения экспрессивности ритмоощущений $K_{\Sigma-cp}$ (наряду с максимальным значением $K_{\Sigma-max}$) для того же текста.

Для сравнительного анализа индикативных показателей эмоциональных состояний (ЭС) нами введены в оборот и используются следующие параметры: 1) импульсивность гармонического ритма IMP – колеблемость (размах) величин PGT O_i относительно среднего значения O_{cp} (стандартное отклонение); 2) нестабильность ритмоощущений NS – колеблемость (размах) величин K_{Σ} относительно среднего значения $K_{\Sigma-cp}$ (стандартное отклонение); 3) индекс ритмико-чувственной активности IND. Первые два параметра позволяют оценить степень вариативности (изменчивости, разброса) ритмического движения в стихе с использованием стандартных средств математической статистики, а третий параметр IND является результирующим интегральным параметром стиха, позволяющим

соотносить данные наших исследований со значениями частот головного мозга человека.

Результаты. В докладе приведены значения параметра IND для исследованных автором четырнадцати ЭС и для четырех первых глав романа Пушкина. Показана соотнесенность этих значений с частотными диапазонами биоритмов головного мозга: так, величина IND=35,3 для ЭС «зависть» («Моцарт и Сальери», первая сцена, первый монолог Сальери, «белый» 5-стопный ямб) соотносится с психофизическим состоянием человека «возбуждение» (γ -ритм, частота более 33 гц); величина IND=27,0 для ЭС «восхищение» (стихотворение Пушкина «Кто знает край, где небо блещет», астрофический 4-стопный ямб) – с психофизическим состоянием «умственная работа» (β -ритм, диапазон частот 14–33 гц); величина IND=6,5 для ЭС «ужас» (ЕО, глава пятая, Сон Татьяны, строфы XVIII–XXI, 4-стопный ямб) – с психофизическим состоянием «неприятности» (θ -ритм, диапазон частот 4–7 гц); величина IND=1,5 для ЭС «скука» (ЕО, глава четвертая, Онегин в деревне, 4-стопный ямб) – с психофизическим состоянием «сон» (δ -ритм, частота менее 3,5 гц).

Более того, в рамках гармонического стиховедения текст монолога Онегина (ЕО, глава IV) и его двойственная оценка («проповедь» и «исповедь») получили свое математически наглядное эмоционально-смысловое толкование. «Сепаратное» прочтение монолога определяет величину IND=6,2 (что весьма близко к аналогичному значению для эмоционального состояния «ужас»), а при общем прочтении того же текста IND=2,1. Первый вариант прочтения моделирует процесс восприятия слов Онегина самой Татьяной Лариной, тогда как в общем потоке повествования (читательское восприятие) те же слова звучат более гармонично (O_{cp} равно 2,85 против 1,40) и менее экспрессивно ($K_{\Sigma-cp}$ равно 3,3 против 5,1).

Выводы. Формула вычисления параметра IND поэтического текста позволяет соотнести величины IND с частотными диапазонами биоритмов головного мозга человека и обрести реальный механизм взаимодействия стиховедов, психофизиологов и нейролингвистов. Близость искусствоведческих оценок и основанных на «золотом сечении» результатов изучения стихов Пушкина подтверждают а) давнюю мысль А. Ф. Лосева о том, что закон «золотого сечения» является универсальным законом художественной формы; б) идею И. Канта о том, что посредством гения природа дает правило искусству и что искусство, по словам М. Цветаевой, есть та же природа.

ИНТЕЛЛЕКТУАЛЬНЫЕ ИНФОРМАЦИОННЫЕ ТЕХНОЛОГИИ И МОДЕЛЬ МЕТАЭВОЛЮЦИИ ЧЕЛОВЕЧЕСТВА

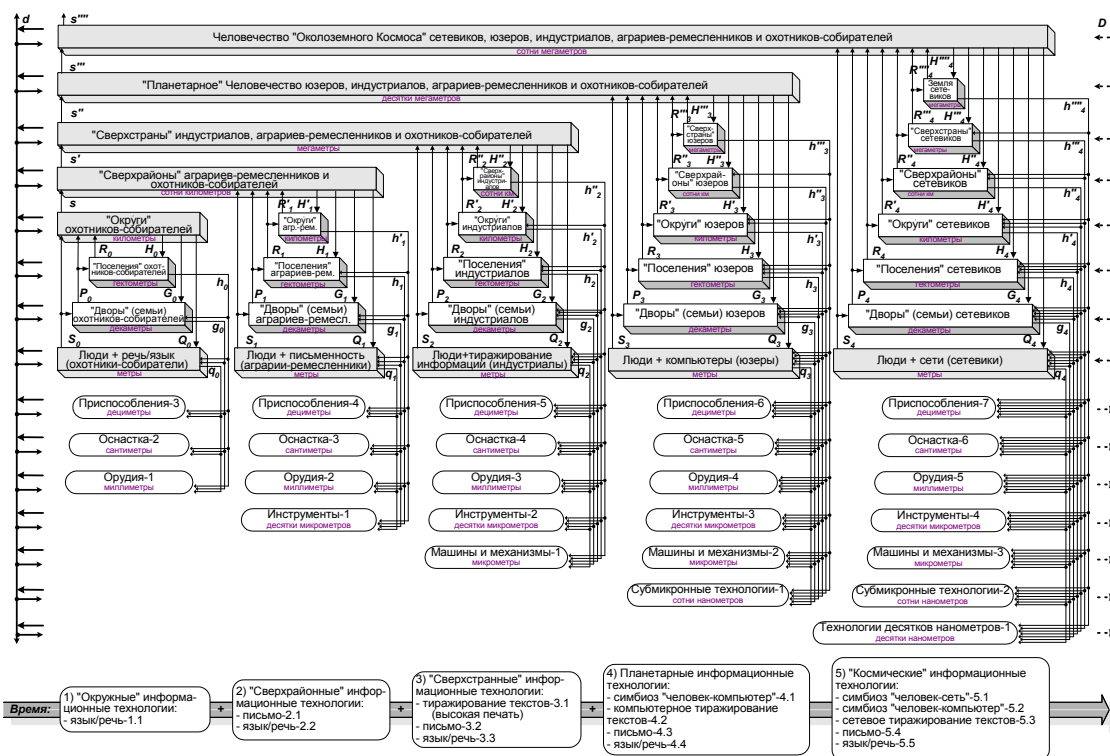
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Очевидно, что интеллектуальные способности человека (его интеллект, разум etc.) существенным образом возрастают в процессе его сапиентизации. Как представляется, она происходила последние 29 млн лет (примерно), считая от возникновения «пред-пред-людей» *Nominoidea*, или ~1,9 млн лет, считая от «пред-людей» *Homo ergaster/Homo erectus*, или ~120 тыс. лет, считая от «собственно» людей *Homo sapiens*. Эти цифры удалось получить расчётным путём на базе междисциплинарного модельного информатико-кибернетического представления о самоуправляющейся иерархической системе Человечества (Гринченко 2007) – см. рисунок. В рамках этой модели последовательные этапы сапиентизации **человека** связываются с нарастанием числа уровней/ярусов в иерархической системе **Человечества** в ходе её формирования – процедурой, названной *метаэволюцией* (там же), – в ходе которой последовательно образуются иерархические подсистемы со всё большей иерархической «высотой» (при чём при возникновении новых подсистем все

ранее сформировавшиеся не элиминируются, а продолжают своё существование, коэволюционируя друг с другом и с Биогееосферой), демонстрирующие всё более сложные и более оптимальные (энергетически) формы своего поведения как целого. Последнее естественным образом распространяется и на базисный элемент Человечества, представляющий собой не собственно «человека» как такового (обладающего сознанием, подсознанием, интеллектом и т. п.), а так называемую *человеко-аппаратурную интеллектуальную единицу* в составе человека и *средств интеллектуализации*, которыми он теоретически может овладеть, осознавая себя – и объективно находясь! – в рамках соответствующей иерархической подсистемы Человечества. Технологии интеллектуализации этой «единицы» усложняются по стадиям: сигнальные позы – мимика/жесты – язык/речь – письменность – тиражирование текстов (книгопечатание) – электронные (компьютерные) средства и память – сетевые (распределённые) средства и память – ... Важно, что технологии интеллектуализации развиваются не обособленно, а в триединстве с коммуникационно-инфраструктурными технологиями и с рабочими технологиями, образуя *информатико-управленческие*



технологии развития Человечества. При этом характерный размер разрешения (достигаемая точность) рабочих технологий в ходе личностно-социально-производственной метаэволюции последовательно измеряется всё меньшими и меньшими цифрами, а протяжённость коммуникационно-инфраструктурных – соответственно всё большими и большими. Таким образом, в последние десятилетия интеллект человека является (в потенции) уже не только продуктом (реализацией) его биолого-психической и «социально-производственной» составляющих, но более сложной комбинацией всего перечисленного плюс интеллектуально-аппаратурного его окружения (антропогенного характера). Чего ещё нельзя было сказать о людях, живших в более ранний период развития Человечества

(Гринченко, Щапова 2010). Очевидно, что подобная интеллектуализация аппаратного окружения человека оказывает весьма значительное влияние на «биолого-психико-социально-производственную» составляющую его интеллекта (вторая, третья и четвёртая компоненты которой, с позиций предлагаемой модели Человечества, претерпевают в последние годы существенные изменения и расширения). Следовательно, при изучении интеллекта современного человека это влияние нельзя недооценивать.

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ПРОЕКТ АВТОМАТИЧЕСКОГО СУРДОПЕРЕВОДА ДЛЯ РУССКОГО ЖЕСТОВОГО ЯЗЫКА

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Жестовая коммуникация может осуществляться посредством трёх знаковых систем: *дактильная азбука, калькирующая жестовая речь, разговорный жестовый язык*. Первые две не являются самостоятельными языками, а лишь кодируют соответственно буквы алфавита или слова звучащего языка. Третья – разговорный жестовый язык – самостоятельная знаковая система, отличная от звучащего языка.

Жестовые языки привлекают всё большее внимание специалистов разных направлений. В частности, примерно 20 лет назад начали разрабатывать системы автоматического сурдоперевода. М. Huenerfauth (2003) обсуждает несколько таких систем, предназначенных для автоматического перевода с английского языка на американский жестовый язык (амслен). Для русского жестового языка действующих систем автоматического сурдоперевода пока нет.

В Институте социальной реабилитации Новосибирского государственного технического университета ведётся работа над созданием

системы автоматического сурдоперевода с русского звучащего языка (РЗЯ) на русский жестовый язык (РЖЯ) (Гриф, Демьяненко, Королькова, 2011). Представление о РЖЯ, лежащее в основе разрабатываемой системы, можно кратко охарактеризовать следующим образом.

1. *Словообразование*. Словообразовательные средства РЖЯ изучены в недостаточной степени. Специальных работ на эту тему в отечественной лингвистике нет, однако некоторые наблюдения имеются. Так, Е. В. Прозорова (2007) отмечает возможность выражения аффиксов путем изменения направления / качества движения.

2. *Морфология*. Многие исследователи (например, Г. Л. Зайцева 2000) полагают, что в РЖЯ нет частей речи, поскольку существуют жесты, могущие выступать как в роли глагола, так и в роли существительного (в зависимости от контекста). Вместе с тем, имеются жесты, которым такая двойственность не присуща (Прозорова, 2009): одни из них обозначают только неизменяемые во времени сущности, другие – всегда представляют собой глаголы.

В РЖЯ нет грамматических средств для выражения категории падежа: все имена и местоимения употребляются в форме именительного падежа. Категория рода у прилагательных также формально не выражается. В РЖЯ имеются формальные средства выражения категории числа существительного, временных и аспектуальных значений глагола, категории лица глагола. Модальность в жестовом языке выражается аналитически. В РЖЯ существуют жесты,

аналогичные именам числительным в звучащем языке. Имеются вопросительные местоимения, союзы. Поскольку в РЖЯ имена не склоняются, предлоги являются не средством подчинения одного полнозначного слова другому в словосочетании или предложении (как в звучащем языке), а средством выражения пространственных отношений. Таким образом, в РЖЯ выделяются классы жестов, аналогичные частям речи в звучащем языке (имя существительное, имя прилагательное, имя числительные, местоимение, глагол, наречие, предлог, союз), которые обладают рядом грамматических категорий, свойственных их аналогам в звучащем языке.

3. *Синтаксис*. Синтаксис РЖЯ довольно свободен. Для сегментации дискурса с целью выделения синтаксических составляющих используются специальные дискурсивные маркеры (пограничные движения головы, остановка рук, моргание, поднятие бровей и т.д.), позволяющие выделять элементарные единицы дискурса (ЭДЕ), аналогичные словосочетаниям и простым предложениям в составе сложных, и супер-дискурсивные единицы (СДЕ), аналогичные простым и сложным предложениям в звучащей речи (Прозорова, 2009). Выявлен ряд факторов, влияющих на порядок слов в предложениях РЖЯ: тип глагола, обратимость предложения, одушевлённость и распространённость дополнения и т.д. (Киммельман, 2010).

4. *Семантика*. Жестовый язык более лаконичен и конкретен (чем звучащий язык), обладает своеобразной пространственной системой референции, локализирующей обсуждаемые объекты в области жестикуляции. Сложность формализации семантики во многом обусловлена классификаторными предикатами (иконические знаки, имитирующие форму, траекторию, способ движения объекта, одна и та же форма руки может обозначать целый класс внешне похожих объектов). М. Huenerfauth (2003), подытоживая опыт создания автоматических сурдопереводчиков, заключает, что перевод методом *трансфер* может быть удовлетворительным лишь в том

случае, если классификаторные предикаты не используются. В противном случае необходим перевод на основе семантического языка-посредника. Для автоматизации сурдоперевода на РЖЯ предлагается использовать пространственный язык-посредник – трёхмерную динамическую систему, отображающую семантику РЗЯ и семантику РЖЯ.

В плане алгоритмической и компьютерной реализации разрабатываемая система автоматического сурдоперевода в определенной степени опирается на созданный ранее (в 1998 г.) Новосибирским государственным техническим университетом первый в мировой практике компьютерный сурдопереводчик для русской калькирующей речи. В ходе реализации некоторых составляющих системы автоматического сурдоперевода на РЖЯ используются существующие алгоритмы морфологического и синтаксического анализа для РЗЯ, модифицированные применительно к решаемой задаче.

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О ФЕНОМЕНЕ РЕМЕТАФОРИЗАЦИИ В ЛЕКСИКЕ ПСИХИЧЕСКИ БОЛЬНЫХ

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«Язык – кладбище потухших метафор»

Ф. Ницше

1) Метафора определяется как иносказание, в основе которого лежит сравнение и перенос значения с одного понятия на другое. Например, слово «настроение» в современном его значении существует лишь с середины 19 века и

произошло от глагола «настраивать», который употреблялся для обозначения процесса настройки музыкальных инструментов. Иначе говоря, слово «настроение» содержит «потухшую» метафору, в основу которой было положено сходство между музыкальным инструментом и душой. Таким образом, этимология слова – это не просто установление его происхождения, но, главным образом, реконструкция утраченной языком метафоры. Согласно современным представлениям, в живом языке постоянно действуют динамичные процессы метафоризации (Lacoff G., 1980) и деме́тафоризации (Rorty R., 1995), в результате которых происходят языковые изменения – обогащается словарь и происходят понятийные сдвиги. Термин «деме́тафоризация» подразумевает превращение переносного значения высказывания в прямое, фигурального языка – в квазيبуквальный. Метафоры “умирают”, превращаясь в общеупотребительные слова в ходе закономерной эволюции языка.

2) Одной из характерных особенностей речевого поведения психически больных является сравнительная структура речевых актов, часто выражающаяся в метафорической форме, что традиционно объясняется трудностью вербализации нового (патологического) чувственного опыта, для выражения которого в естественном лексиконе нет соответствующих слов. Сам же патологический чувственный опыт, включающий измененную эмоциональность, телесные ощущения и восприятие, понимается как результат *протопатического сдвига*, означающего изменение в структуре психических процессов соотношения филогенетически более древней (протопатической) и

более молодой (эпикритической) чувствительности. С другой стороны, согласно гипотезе Б.Е. Микиртумова (2000), протопатическому уровню реагирования сопутствует искажение процессов смыслообразования, выражающихся *семантической транспозицией*, при которой активизируются филогенетически старые познавательные структуры, направленные на раскрытие смысла происходящих изменений, что отражается и в речевой организации патологического опыта.

3) Цель нашего исследования заключалась в установлении возможной связи между «регрессивной» (в теории) психикой больных и метафоричностью (фактически) их лексики, т. е. в попытке объяснить метафорическое высказывание как результат психического и речевого «возврата в прошлое» – как своего рода *реметафоризацию*, вектор которой направлен в сторону, противоположную естественной эволюции языка. Всего было проанализировано 241 высказывание психотических больных, страдающих шизофренией (58 человек), органическими (32 человека) и аффективными (15 человек) психозами. Этимологический анализ лексики больных проводился при помощи словарей М. Фасмера (1986) и П. Я. Черных (1999).

В таблице 1 показаны результаты поиска «умерших» («потухших») метафор. В первой колонке приведены слова, обозначающие некоторые эмоциональные состояния; во второй – глаголы («вызывающие» телесные ощущения), от которых произошли названия соответствующих эмоций; в третьей – примеры высказываний больных. Очевидно, что древние значения современных слов, выражающих оттенки

Эмоция	Этимология	Примеры высказываний больных
Печаль	Печь	<i>Припекание мозга... как будто кипятильником... как горчичник запёк</i>
Горе	Гореть, жечь	<i>Ощущение горения всего тела – как будто его обжигают кипятком</i>
Грех	Греть	<i>Мозг чем-то нагревается или остужается</i>
Стыд	Студить (но сгорать от стыда)	<i>На сердце как будто ледяной водой; холодное жжение в желудке</i>
Мучение, мука	Мять, давить	<i>Зажимание, сдавливание груди; как ребром ладони на мозг давит</i>
Тоска, гнёт	Давить, теснить	<i>Блуждающее давление в области лба и затылка</i>
Грусть	Грызть	<i>Тягость в груди – как грызет изнутри</i>
Сожаление	Жалить, колоть	<i>Проколами как ишлом по всей голове; как будто чем-то проткнули уши насквозь</i>

Таблица 1. Метафоры, которые мы утратили.

душевного страдания (тоска, грусть, печаль и т.д.), совпадают с современными значениями слов, описывающих телесную (т.е. древнюю) чувствительность.

Легко заметить, что лексика больных содержит метафоры, подобные тем, что сотни лет назад породили всё многообразие современных слов, обозначающих эмоциональные состояния, но со временем утративших свою метафоричность (т.е. претерпевших процесс демегафоризации).

4) До рубежа I/II тысячелетий в русском языке отсутствовали слова, обозначающие такие эмоции, как «тоска», «грусть», «печаль», и единственным способом вербализации соответствующих душевных состояний тогда являлась метафора, опирающаяся на телесные ощущения, возникающие при воздействии на человека, способном уничтожить (или покалечить) его одним из двух известных с глубокой древности способов: механическим либо термическим.

Гипотеза: *языковое поведение исследованных больных отражает, а точнее – выражает чувство неблагополучия протопатического уровня*

при помощи лексических средств, наиболее соответствующих этому древнему уровню чувствования, а именно – старой языковой игры, возрождаемой больным, благодаря стихийно действующим механизмам реметафоризации. Содержанием метафоры, т.е. смыслом, который она выражает, является *угроза жизни или здоровью*, о чём свидетельствует значение ключевых тематических рядов нашего исследования, относящихся к двум семантическим полям: 1) «давление» (этимология восходит к глаголам «душить», «умерщвлять») и 2) «жжение» (восходит к выражению «уничтожать огнем»).

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НЕЙРОБИОЛОГИЧЕСКИЕ КОРРЕЛЯТЫ СЕНСИТИВНОСТИ КОММУНИКАТИВНО-КОГНИТИВНЫХ СИСТЕМ

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К настоящему времени выявлены и всесторонне изучены связи когнитивных процессов с нейрофизиологическими характеристиками, показателями памяти (Лурия, 1974), речью, свойствами личности (Холодная, 2004), коммуникативными особенностями (Пашукова, 2009). Классификация подсистем психики, обеспечивающих адекватное отражение действительности и регуляции поведения и деятельности, предложенная Н. И. Чуприковой (2007), позволяет структурировать исследования механизмов связи разномодальных психических процессов.

В настоящей работе представлена попытка структурного анализа взаимосвязи нейропсихологических характеристик памяти, эффективности когнитивной деятельности, коммуникативных свойств личности и характеристик биоэлектрической активности мозга. В исследовании приняли участие 120 испытуемых (студенты в возрасте

18–25 лет). Нейропсихологическое тестирование слухоречевой памяти проводили с помощью методики «Лурия-90» (Симерницкая Э. Г. (1991), модификация Давыдовой Е. Ю.) Для анализа был выбран показатель «регуляция и контроль слухоречевой памяти», связь которого с различными аспектами психической деятельности была показана нами. ЭЭГ-исследование проводилось при помощи системы «Brainsys» в состоянии спокойного бодрствования с закрытыми глазами и во время выполнения субтеста шкалы Векслера «недостающие детали». Корреляционный анализ с параметрами слухоречевой памяти проводился при помощи теста Пирсона.

Другие исследованные параметры представлены в таблице результатов корреляционного анализа (показаны только достоверные результаты, $p < 0,05$)

Показатели регуляции слухоречевой памяти отрицательно коррелировали со спектральной мощностью β -1 в диапазоне как в фоновой записи, так и во время выполнения пробы Векслера «Недостающие детали». При интеллектуальной нагрузке также выявилась отрицательная связь с мощностью α -диапазона в левых передних зонах коры, что может быть признаком недостаточной

Отрицательная корреляция	Тест Векслера	Положительная корреляция
Стремление давать социально желаемые ответы (шкала лжи по тесту Айзенка и тесту Томаса) Субтест «Недостающие детали»	Субтест «Арифметический»	Объем, тормозимость, прочность, регуляция и контроль слухоречевой памяти Объем произвольного запоминания Перфекционизм (суммарный показатель по тесту Н. Г. Гараян)
Регуляция и контроль слухоречевой памяти Прочность слухоречевых следов Обида, Косвенная агрессия (тест Басса-Дарки)	Субтест «Недостающие детали»	Компромисс (тест Томаса) Негативизм, Раздражение (тест Басса-Дарки) «Понятливость», «Осведомленность», «Словарь», «Складывание фигур» (субтесты шкалы Векслера)

Таблица 1. Корреляционные связи исследованных показателей.

активации лобных отделов и снижения уровня контроля.

Значимая отрицательная корреляция между показателями субтестов «Арифметический» и «Недостающие детали» может быть рассмотрена с точки зрения оптимальных условий процесса решения задач. Так, решение арифметических задач в уме не требует внимания к тонким деталям и наиболее эффективно при точном восприятии основных элементов и их соотношений и рациональном выборе комбинаторной схемы действий. Учитывая средний уровень заданий, успешность решения во многом зависит от мнестических способностей и устойчивости образа действия. Нахождение недостающих деталей, наоборот, предполагает большую разветвленность когнитивных структур, вовлечение ассоциативных связей, что подтверждается высокими корреляциями с результатами субтестов, выявляющих гибкость мышления, широту кругозора, уровень развития речи и пространственных представлений.

При снижении уровня контроля эти же когнитивные особенности могут приводить к возникновению парафазий и побочных ассоциаций при запоминании, что отражается на показателе «регуляция и контроль» слухоречевой памяти. Таким образом, небольшое снижение показателя регуляции памяти может свидетельствовать о чувствительности различных функциональных систем и подвижности процессов дифференциации. Дальнейшая активизация этого процесса приводит, по видимому, к гиперчувствительности, затрудняющей аналитико-синтетические процессы из-за избыточного количества элементов и неструктурированности их связей, что и приводит к возникновению симптомов тревожности. Связь β -активности с тревожностью была показана как при исследовании ЭЭГ детей

с различными видами неврозов (В. В. Бобкова, 1974), так и у взрослых испытуемых (С. В. Панюшкина, 2000). Нарушения регуляции и контроля слухоречевой памяти, выходящие за границы нормативных значений, наблюдаются также у лиц с психическими расстройствами и различными нарушениями развития, но в этих случаях имеют место специфические изменения биоэлектрической активности мозга. Используя структурный анализ корреляционных связей разномодальных показателей процесса, можно судить о его возможных механизмах.

Анализ результатов нейропсихологического тестирования слухоречевой памяти и личностных тестов в сопоставлении с данными спектрального анализа ЭЭГ в фоне и при выполнении теста позволяет сделать предположение о том, что колебания уровня спектральной мощности диапазона β -1 в некоторой степени отражают чувствительность и подвижность коммуникативно-когнитивной системы.

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СВЯЗЬ КОГНИТИВНЫХ И ПСИХОЛОГИЧЕСКИХ ХАРАКТЕРИСТИК ЛИЧНОСТИ С ВРЕМЕННЫМИ ПОКАЗАТЕЛЯМИ ЭЛЕМЕНТАРНОЙ ДЕЯТЕЛЬНОСТИ

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Индивидуальные особенности когнитивной деятельности обусловлены множеством факторов, отражающих не только дискриминативные способности мозга, но и эмоционально-личностные характеристики человека. К настоящему моменту накоплено значительное количество данных о связи времени реакции человека с показателями тестов интеллекта (Чуприкова, 1995). Значительное внимание уделяется изучению ориентировочной реакции, особенности которой, как было показано еще Бернштейном (1979), подвержены многочисленным когнитивным и мотивационным эффектам и связаны с характеристиками темперамента и личности (Кочубей, 1987). Феномен мотивации в свою очередь близок вниманию, являющемуся, по мнению Величковского (2006), координационной структурой процессов оперативного достижения цели.

В то же время проблема учета индивидуального типологических и мотивационных влияний при выполнении когнитивных задач человеком весьма затруднена из-за сложности учета таких переменных, как личная актуальность и индивидуальная интерпретация.

Одним из возможных путей преодоления этих трудностей может служить метод изучения характеристик элементарной деятельности в ситуации свободного выбора. Методики

организации проблемного пространства успешно используются при изучении рассудочной деятельности животных и позволяют судить о принципиальных возможностях выполнения той или иной задачи, а также выявлять индивидуальные типы познавательной активности (Никольская К. А., 2010). В нашем эксперименте эффект моделирования задачи самим участником достигается за счет предельного упрощения алгоритма, что позволяет оценить индивидуальную интерпретацию задачи.

Исследование проводилось с помощью оригинальной компьютерной методики. В нем участвовали 40 испытуемых в возрасте от 19 до 35 лет. Испытуемым предлагалось нажимать на кружок, который после нажатия исчезал. Эксперимент состоял из 4-х серий. В *первой* серии время предъявления стимула не ограничивалось. Во *второй* изменялся цвет стимула, время предъявления ограничивалось и постепенно уменьшалось. В *третьей*, дифференцированной, серии – последовательно предъявлялись кружочки двух цветов, исчезающий (как в серии 1) и не исчезающий.

В *четвертой* серии последовательно предъявляли три матрицы со стимулами двух и четырех цветов, при нажатии исчезали только кружки основного цвета.

Во всех сериях фиксировались время, точность и последовательность нажатий. Анализировались следующие характеристики элементарной деятельности: среднее время реакции, временная задержка при смене цвета стимула, величина максимального ускорения, количество промахов, количество нажатий на

↑ Доска Аннет ↓ Количество ударов в минуту (по теппинг-тесту)	↑ Среднее время реакции	↓ Показатели слухоречевой памяти ↓ Оценка по субтесту «складывание фигур» (тест Векслера)
	↑ Временная задержка	↑ Показатель косвенной агрессии (по тесту Томаса) ↓ Оценка по субтесту «Словарный» (тест Векслера)
↑ Коэффициент силы нервной системы (по теппинг-тесту)	↑ Максимальное ускорение	↑ Перфекционизм (суммарный показатель по тесту Н. Г. Гараян)
↓ Результат пробы «субъективная минута»	↑ Количество промахов	↓ Показатель тормозимости слухоречевой памяти
↑ Количество промахов	↑ Количество повторных нажатий	↑ Приспособление (по тесту Томаса)

Таблица 1. Корреляции характеристик элементарной деятельности с результатами комплексного тестирования. Учитывались только значимые корреляции не ниже 0,35.

↑ – корреляция положительная, ↓ – корреляция отрицательная.

неисчезающие стимулы. Результаты корреляционного анализа этих показателей с результатами различных тестов приведены в таблице 1.

Временные характеристики элементарной деятельности ожидаемо коррелируют с результатами тестирования слухоречевой памяти и динамическими показателями, полученными традиционными методами (проба Аннет, теппинг-тест). В то же время средние значения этих корреляций свидетельствуют о том, что уменьшение времени реакции при выполнении тех же действий «на скорость» является индивидуальной характеристикой и может отражать не только особенности нервной системы, но и уровень мотивации. Сущностная доминанта стремления к более быстрому выполнению задания также может быть различной, и ее конкретизация возможна только при учете индивидуальной интерпретации задачи. Так, в предлагаемой задаче внутреннее стремление к достижению успеха (перфекционизм) наиболее ярко проявляется на этапе ускоренного предъявления стимулов, тогда как такая характерологическая особенность, как приспособление, отражается в стремлении выполнить действие, не анализируя результат, что выражается в многократном нажатии на неисчезающие стимулы.

Показатель временной задержки при смене цвета стимула, по-видимому, отражает баланс ориентировочной и оборонительной реакций,

что подтверждает его связь с уровнем косвенной агрессии. Когнитивный эффект преобладания оборонительной реакции выражается в трудностях дифференциации близких понятий, сужении семантических полей, что ухудшает выполнение словарного субтеста (по Векслеру).

Можно заключить, что психологические и когнитивные особенности личности отражаются на различных характеристиках элементарной деятельности. Дальнейшие исследования в этом направлении позволят создать комплексные критерии дифференциации мотивационных, личностных и психофизиологических эффектов в познавательной деятельности.

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НЕЙРОНАЛЬНОЕ ОТОБРАЖЕНИЕ ПРОЦЕССОВ ЗАПОМИНАНИЯ И ОПОЗНАНИЯ ИСКУССТВЕННЫХ ОБЪЕКТОВ ПО ДАННЫМ АКТИВИРОВАННЫХ ЧАСТОТНО-СЕЛЕКТИВНЫХ ГЕНЕРАТОРОВ МОЗГА

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Информация об окружающем мире представлена в памяти не только репрезентациями в виде отдельных объектов, ландшафтов, ситуаций, действий, событий, но и в форме их обобщений, категорий. Категоризация – жизненно важный когнитивный процесс, позволяющий правильно идентифицировать любой объект, событие и связывать его с соответствующим поведением. Запоминание новых объектов (стимулов) и их опознание также предполагает участие процесса категоризации, направленного как на сами объекты, так и на действия, которыми требуется на них отвечать. По литературным данным, изучение нейрональных механизмов категоризации

ведется в трех основных направлениях: изучаются процессы и структуры мозга, вовлеченные в репрезентацию категорий самих объектов (1); исследуется, как выбирается действие или поведение, которое связывается с объектом, и как оно обобщается (2); изучается влияние тренировки, научения на динамику процесса формирования категории (3). Литературные данные дают основание связывать процесс категоризации со взаимодействием неокортекса со многими подкорковыми структурами, в том числе со стриопаллидарной системой, ее базальными ганглиями. Это обстоятельство существенно снижает возможности исследователей, так как требует регистрации нейронной активности в структурах мозга у животных или использования томографических методов отображения активности в подкорковых структурах мозга (фМРТ, ПЭТ).

В настоящей работе эта проблема разрешается с помощью метода микроструктурного анализа осцилляторной активности мозга (МАО), базирующегося на пейсмекерной гипотезе ритмогенеза (Данилова, 2005–2011). Он позволяет получать нейрональные показатели работы мозга, используя данные многоканальной ЭЭГ для вычисления эквивалентных токовых диполей (модель подвижных диполей) для узкополосных частотных составляющих, извлекаемых частотной фильтрацией с шагом в 1 Гц из потенциалов, связанных с событиями (ПСС). По полученным координатам эквивалентные диполи накладываются на структурные томографические срезы индивидуального мозга. Метод МАО выявляет активированные частотно-селективные генераторы, отображающие активность пейсмекерных нейронов, и локализует их активность в структурах мозга (Данилова, 2009, Данилова и Страбыкина, 2011). Настоящая работа посвящена изучению процесса запоминания зрительно предъявляемых искусственных стимулов (шахматных паттернов) и зависимости его от выполняемого способа обучения. Метод поэтапного формирования по П.Я. Гальперину сравнивается с традиционным методом «проб и ошибок». Для проверки результатов обучения используется процедура опознания стимула. Цель исследования – новым методом (МАО) получить результаты о процессе категоризации, не противоречащие литературным данным, полученным другими методами, получить подтверждение гипотезы о том, что метод обучения по схеме поэтапного формирования более эффективен, так как более ориентирован на формирование категорий в сравнении с методом «проб и ошибок». Эксперимент, включавший задачу на опознание целевого зрительного стимула и игнорирование дифференцировочного, выполнен на 8 испытуемых в возрасте от 25 до 39 лет. Эксперимент включал две серии с регистрацией ЭЭГ: до обучения и после обучения. Обучение, направленное на улучшение запоминания целевого стимула, производилось без регистрации ЭЭГ, осуществлялось двумя методами: методом планомерно-поэтапного формирования по П.Я. Гальперину и традиционным методом «проб и ошибок». В соответствии с типом обучения были составлены экспериментальная и контрольная группы испытуемых. В каждой серии для запоминания многократно предъявлялся стимул (С1). После него для опознания следовал С2 (целевой) или С3 (дифференцировочный). Стимулами были квадратные матрицы: черно-белые шахматные паттерны (4x4). Условием опознания целевого

стимула было обязательное наличие в С2 зачернения только одной клетки из 4-х клеток матрицы стимула С1. В С3 количество зачерненных клеток не совпадало с требованием инструкции. На С2 следовало нажимать на кнопку, на С3 не реагировать. Предметом анализа данной работы является ПСС на целевой стимул (С2) до и после обучения, который обрабатывался методом МАО. Полученные результаты показали, что на поведенческом уровне экспериментальная группа после обучения достоверно отличалась от контрольной только более коротким латентным периодом моторной реакции на целевой стимул при одинаковом увеличении числа правильных ответов на целевой и дифференцировочный стимулы в обеих группах. Однако анализ уровня активности частотно-селективных генераторов тета ритма, который связывают с процессами памяти (с запоминанием информации и извлечением ее из памяти), выявил отчетливое различие процессов в мозге: выявление активности тета генераторов в экспериментальной группе и ее снижение в контрольной. Обучение по методу П.Я. Гальперина по данным локализации тета генераторов в координатах атласа мозга Talairach формирует мощную зону активности в неокортексе (височной, фронтальной областях) и в парагиппокампальной извилине. Вторая зона активности возникает в стриопаллидарной системе: охватывающей входные (n. caudate, putamen, n. accumbens) и выходные (globus pallidum, substantia nigra) ядра базальных ганглиев. В контрольной группе после обучения методом «проб и ошибок» появление активности в базальных ганглиях было очень слабым. Полученные результаты согласуются с литературными данными, связывающими процесс категориального формирования с височно-фронтальными областями коры и базальными ганглиями, которые, образуя обратные связи через таламус, формируют сложные петли взаимодействия. В эксперименте, где требуется только запоминать стимул и опознавать его среди других, уже под влиянием обучения в мозге развиваются события, которые были описаны при решении задач на категоризацию стимулов и связаны с процессом обобщения. Метод формирующего обучения по П.Я. Гальперину в сравнении с традиционным методом «проб и ошибок» более эффективно стимулировал локальные изменения в активности мозга, которые связывают с формированием категорий.

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СОСТОЯНИЯ УСТОЙЧИВОГО КОГНИТИВНО-СПЕЦИФИЧЕСКОГО ВНИМАНИЯ И КВАЗИСТАЦИОНАРНЫЕ ПАРАМЕТРЫ ЭЭГ

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Введение. Исследования мозговых механизмов внимания показали, что есть основания говорить о различных формах внимания со своими нейрофизиологическими механизмами (см. напр. обзор Raz, Buhle 2006). Вместе с тем пока отсутствует общепринятое определение внимания, объединяющее непротиворечивым образом все известные явления, относимые к этой категории (Фаликман, 2006). На данном этапе относительно более плодотворными, по-видимому, могут быть подходы к исследованию механизмов внимания, базирующиеся на широком понимании внимания как системного многоуровневого явления, лежащего в основе интеграции когнитивных, эмоциональных и регуляторно-волевых процессов (Веккер, 2000), и признающие возможную зависимость механизмов внимания от реализуемых с его участием психических и поведенческих проявлений (Безденежных 2003). Такое понимание, в частности, позволяет рассматривать мозговые механизмы внимания, обеспечивающего готовность и оптимальные условия для выполнения определённой умственной деятельности, достаточно устойчивой во времени. Возможности исследования корковых механизмов подобных состояний внимания с использованием квазистационарных (усредняемых на соответствующих временных интервалах) параметров локальной и пространственной синхронизации электрической активности коры мозга могут быть достаточно наглядным образом проиллюстрированы приводимыми результатами спектрального анализа электроэнцефалограмм (ЭЭГ), зарегистрированных в состояниях покоя, запоминания и извлечения из памяти вербальной информации.

Методика. ЭЭГ регистрировались в 19 стандартных отведениях у 88 испытуемых-студентов (для оценки воспроизводимости динамики

параметров ЭЭГ группа испытуемых делилась случайным образом на две равные по численности подгруппы) в состояниях: покоя с открытыми глазами; запоминания (заучивания) вербальных двуязычных семантических пар (латинский и русский языки); поиска в памяти (контроля) заученной информации. Регистрировалась также электрокардиограмма с целью подсчёта средней частоты сердечных сокращений (ЧСС) в каждом из состояний и оценка испытуемыми субъективной трудности выполнения заданий. Статистическое сравнение средних индивидуальных оценок спектральной мощности и когерентности ЭЭГ в этих состояниях производилось по планам посубъектных сравнений (within-subjects design) для диапазонов частот тета (4–7 Гц), альфа-1 (7–10 Гц), альфа-2 (10–13 Гц), бета-1 (13–18 Гц), бета-2 (18–30 Гц), гамма (30–40 Гц) с учётом поправок на множественность сравнений. Наиболее существенные для каждого конкретного контраста элементы в массовой динамике статистически значимых различий когерентности (СЗРК) выделялись на основе введенных количественных оценок, учитывающих частоты проявления («частоты») СЗРК конкретных пар отведений в совокупности частотных диапазонов и степень выраженности этих СЗРК.

Результаты. Между состояниями запоминания и поиска в памяти не выявлено значимых различий ни по показателю ЧСС, ни по субъективной оценке трудности заданий. Для ЭЭГ наиболее общей характеристикой полученных результатов является множественность статистически значимых различий мощности (СЗРМ) и когерентности (СЗРК) разного уровня значимости во всех рассматриваемых сравнениях и частотных диапазонах. При делении группы на подгруппы в рассматриваемых сравнениях качественно сохраняются характеристики как множественности, так и направленности (знаков) СЗРМ и СЗРК в каждом из частотных диапазонов.

Сравнение активных состояний с референтным состоянием покоя показало, что в большинстве частотных диапазонов изменения мощности ЭЭГ в обоих активных состояниях

однонаправлены (возрастание в диапазонах тета, бета2 и гамма, убывание в диапазоне альфа2), за исключением диапазона альфа-1, в котором запоминание сопровождается преимущественно уменьшением мощности, а извлечение из памяти – увеличением. При этом в состоянии запоминания мощность ЭЭГ гамма-, бета2-и тета-диапазонов достоверно меньше, чем при поиске в памяти, на всей поверхности коры.

Динамика когерентности ЭЭГ более специфична. При переходе из состояния покоя в состояние запоминания доминирует уменьшение когерентности ЭЭГ в различных частотных диапазонах, а при переходе в состояние извлечения из памяти – увеличение когерентности ЭЭГ в большинстве частотных диапазонов, за исключением диапазона альфа2. В большей степени зависит от характера деятельности и топика СЗРК. Паттерны пар отведений, обнаруживающих достоверные различия не менее чем в 5 частотных диапазонах, чётко дифференцированы (не имеют общих элементов) при сопоставлении каждого из мнестических состояний с состоянием покоя. Соответствующий паттерн для состояния запоминания образован преимущественно парами отведений в передней области коры; для состояния извлечения из памяти – парами отведений в задней области коры и парами отведений из обеих областей. Полученные результаты корреспондируют современным представлениям о формировании соответствующих ситуациям состояний внимания (context appropriate attentional sets – Buckner 2003 и др.) для реализации сложных когнитивных, в том числе мнестических, задач, нисходящего (top-down) контроля и организации релевантного

поиска в памяти (Cabeza 2008, Ciaramelli et al. 2009 и др.)

Заключение. Показано, что множественные СЗРМ и СЗРК ЭЭГ могут быть выявлены как при сравнении ЭЭГ состояния покоя с ЭЭГ активных состояний, так и при сравнении ЭЭГ активных состояний между собою. Такие изменения в совокупности частотных диапазонов и на всём пространстве коры (в пределах доступной разрешающей способности), по-видимому, наиболее адекватным на сегодняшний день образом отражают интенсивную реорганизацию мозговых сетевых механизмов, обеспечивающую эффективность конкретных видов умственной деятельности. Представляется предпочтительным связывать выявляемые таким образом средние по времени характеристики ЭЭГ с тоническими компонентами устойчивого внимания, специфическим образом обеспечивающими выполнение конкретной когнитивной деятельности.

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ВЛИЯНИЕ УТОМЛЕНИЯ НА ПРОЦЕССЫ, ПРЕДШЕСТВУЮЩИЕ ВНИМАНИЮ

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Работа посвящена одному из компонентов слуховых вызванных потенциалов (ВП) – р50. Этот компонент представляет интерес, так как подавление амплитуды этого потенциала при повторном предъявлении стимула является показателем явления сенсорного

дозирования информации, а также, возможно, связано с процессом предвнимания (Naatanen, 1990).

Сенсорное дозирование информации (СДИ) (Сенсорный gating) – это процесс дозирования поступающей для обработки сенсорной информации, посредством которого мозгом регулируется величина ответов на стимулы. При предъявлении одного стимула возникает некоторый ответ. Но при предъявлении второго такого же стимула сразу вслед за первым ответ на второй стимул в норме будет подавлен. Предполагают, что это своеобразный адаптационный механизм,

позволяющий мозгу предотвращать чрезмерную стимуляцию, или, иначе говоря, сенсорную перегрузку. Это позволяет мозгу фокусироваться на конкретном стимуле, если стимулов сразу предъявляется несколько. Механизм включает в себя процессы прямого и обратного торможения воспринимаемых стимулов. Иными словами, сенсорное дозирование – это аналог механизма латерального торможения, только не в пространстве, а во времени, позволяющий мозгу разнести во времени обработку информации.

В работе изучалось влияние утомления на подавление коротколатентного компонента р50 слуховых ВП. В ходе эксперимента испытуемым предъявлялись 4 блока с акустическими стимулами. Сложный стимул состоял из 2-х щелчков длительностью 1 мс, расстояние между щелчками составляло 500 мс. Стимулы подавались на фоне белого шума, который использовался для маскировки сигналов окружающей среды. ЭЭГ регистрировалась по 7 отведениям (C3, C4, Cz, F3, F4, P3, P4), расположенным по системе 10–20, но компонент р50 лучше всего выражен в отведении Cz, поэтому данные для обработки были взяты именно из этого отведения ЭЭГ. Для получения эффекта утомления испытуемым предлагалось статически нажимать на ручку динамометра. Первый блок – контроль, без нагрузки; второй блок – нагрузка 7% (от максимальной силы сжатия конкретного испытуемого); третий блок – нагрузка 30% (от максимальной силы сжатия конкретного испытуемого); четвертый блок – восстановление, без нагрузки.

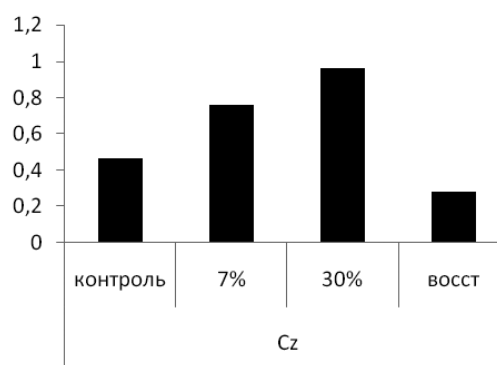


Рис. 1. Разница амплитуды компонента р50 слуховых ВП («амплитуда ответа на первый стимул» – «амплитуда ответа на второй стимул») (мВ)

Полученные результаты (рис. 1) говорят о том, что сильная нагрузка (30%) улучшает подавление компонента р50 на повторно предъявляемый стимул, разница подавления в контроле и при 30% нагрузке достоверна. Также следует отметить, что при сильной нагрузке (30%) наблюдается значительное увеличение амплитуды данного компонента ВП. Это может быть связано с дополнительной активацией системы сенсорного дозирования информации при сильной физической нагрузке.

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СЕМАНТИКА НАРРАТИВА О ДЕТСТВЕ КАК «ЗЕРКАЛО» ТЕКУЩЕЙ САМОИДЕНТИЧНОСТИ

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Представленный в автобиографической памяти (АП) целостный образ личного прошлого традиционно оценивается с точки зрения номенклатуры воспоминаний и их временного распределения. Установлено, что перечень воспоминаний, включаемых в историю своей жизни представителями одной культуры, совпадает более чем на 70%. Отсюда предполагается, что за процессом транспонирования индивидуально вариативного жизненного

опыта в устойчиво воспроизводимый в социальном контексте автобиографический нарратив стоит культурная модель типичной судьбы человека – культурный жизненный сценарий (КЖС). Показано, например, что овладение КЖС завершается в старшем подростковом возрасте, а его структура является наиболее проработанной относительно юности и молодости, что ведет к закономерной трансформации АП – феномену «универсального пика воспоминаний» (непропорционально высокое количество воспоминаний, относимых к указанному периоду жизни).

Несмотря на то, что реализуемая в настоящее время методология изучения КЖС

позволила получить ряд ценных результатов, в ее рамках возможно анализировать лишь внешнюю формальную сторону воспоминаний (что помнится) и нельзя выявить внутреннюю смысловую сторону существования опыта в АП (как помнится). В связи с этим нами была разработана компьютеризированная методика анализа автобиографических нарративов, направленная на создание динамичных «семантических профилей» КЖС на основе выявления, подсчета и нормализации относительно семантических единиц нарратива (воспоминаний) вербальных маркеров стиля осмысления своего прошлого опыта.

В представленном исследовании была изучена динамика вербальных маркеров параметра связанности – автономности (*relatedness – autonomy*) в воспоминаниях о различных возрастных периодах прошлого. Объектом исследования стали автобиографические нарративы, которые после усреднения представляли типичные для конкретных культурных общностей (городские и деревенские респонденты) КЖС. Согласно основной гипотезе исследования, за внешней ригидностью номенклатуры и последовательности воспоминаний, специфичной для культурной общности, скрывается динамичная система переинтерпретации воспоминаний в свете ведущих характеристик текущей идентичности личности. Для диссоциации фактора устойчивой семантики каждого из включенных в КЖС воспоминания нами были сформированы четыре группы респондентов: городские – пожилые, городские – средний возраст, деревенские – пожилые, деревенские – средний возраст. Дополнительно были привлечены две аналогичных подгруппы мигрантов – лиц, которые родились и выросли в деревне (таким образом, предполагается, что они присвоили КЖС, типичный для деревни) и затем в годы юности мигрировали в город. Каждая из подгрупп включала по 20 респондентов. По разработанной авторами методике анализировались свободные интервью, полученные от респондентов в ответ на инструкцию «Расскажите свою жизнь». Предполагалось, что в то время как событийное и временное распределение воспоминаний у представителей различных возрастных групп будет стабильно отражать специфичный (деревенский или городской) КЖС, семантика воспроизводимых воспоминаний окажется динамичной.

Полученные результаты поддерживают гипотезу исследования. Были выявлены субкультурные различия между заключенными в

автобиографических нарративах респондентов городской и деревенской выборки КЖС. В целом в городском КЖС в описании большинства событий прошлого наблюдается сбалансированный уровень маркеров связанности и автономности, в то время как в деревенском КЖС маркеры связанности почти двукратно преобладают над маркерами автономности. Воспоминания мигрантов тяготеют скорее к городской модели. При сохранении линейного порядка номенклатуры ключевых воспоминаний, составляющих культурно специфичный сценарий, внутренняя семантика воспроизведения событий является динамичной. Причем обнаруженная динамика является не устойчивым свойством определенного КЖС, а зеркально отражает текущую идентичность личности (в соотношении с рассказом о я-сейчас). Так, у представителей старшей группы городской выборки наблюдается резкое повышение насыщенности маркерами связанности рассказов, относящихся к детству и недавнему времени (возраст 68 лет и старше). У представителей старшей группы деревенской выборки, наоборот, воспоминания о детстве и воспоминания о недавнем прошлом высоко насыщены маркерами автономии. Особенно показательны данные, полученные на мигрантной выборке. Являясь носителями деревенской КЖС, они, тем не менее, вспоминают свое детство в автономной манере на фоне значимо более резкого по сравнению с городскими по происхождению ровесниками нарастания пропорции маркеров автономии в нарративе о недавнем прошлом. Участники исследования среднего возраста из всех групп подобной тенденции не демонстрируют.

Таким образом, мы приходим к выводу о том, что семантика воспоминаний о детстве является наиболее чувствительной к текущей идентичности человека. Сохраняя событийную приверженность КЖС, память о детстве представляет собой своеобразное «зеркало» наличной конфигурации характеристик личности. Полученные результаты соответствуют нашему общему пониманию АП как динамичного процесса постоянного соотношения образов прошлого, настоящего и будущего с текущей деятельностью человека, структурой и содержанием его личности.

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ДИСФУНКЦИИ КОГНИТИВНОГО КОНТРОЛЯ ПРИ ПЕРЕРАБОТКЕ АФФЕКТИВНОЙ ИНФОРМАЦИИ У БОЛЬНЫХ ГЕРОИНОВОЙ НАРКОМАНИЕЙ

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Многие авторы указывают на фундаментальное значение процессов когнитивного контроля для способности к успешному подавлению сиюминутного стремления к приятным стимулам, преодолению гиперсенситивности к немедленному вознаграждению и игнорированию негативных последствий (Buhringer G., Wittchen H., Gottlebe K., Kufuld C., Goscke T. 2008).

В связи с этим, в настоящее время одно из перспективных направлений современных клинико-психологических исследований состоит в изучении дисфункций когнитивной деятельности лиц с аддитивным поведением.

Нами было проведено исследование, целью которого являлось системное описание этапов переработки аффективной провоцирующей информации у больных героиневой наркоманией и выявление возникающих дисфункций когнитивного контроля. Исследование предполагало моделирование процесса восприятия информации в условиях воздействия провоцирующих раздражителей и регистрацию комплекса перцептивных (данные движений глаз), поведенческих (характеристики двигательных, вербальных реакций, успешность выполнения заданий) и физиологических (динамический показатель диаметра зрачка) показателей, позволяющих оценить основные проявления нарушений регуляции когнитивных процессов в отмеченных условиях. Был разработан и модифицирован ряд экспериментальных задач, предъявляющих высокие требования к уровню функционирования когнитивного контроля.

Обследовано 30 человек, в прошлом не употреблявших ПАВ, и 22 человека, больных героиневой наркоманией.

Установлено, что на ранних этапах селективной переработки образной и вербальной провоцирующей информации больные героиневой наркоманией обнаруживают нарушенную способность к подавлению переработки нерелевантных стимулов, что проявляется в повышении количества и длительности «ошибочных» зрительных фиксаций на нецелевых сценах, ассоциирующихся с употреблением героина.

Результаты исследования свидетельствуют о снижении успешности когнитивной деятельности в условиях предъявления стрессогенной провоцирующей информации на поздних этапах селективной переработки, проявляющемся в возрастании количества ошибок, времени зрительного поиска, времени реакции на целевые стимулы.

Основной когнитивной стратегией, используемой больными героиневой наркоманией для повышения успешности выполняемой деятельности и снижения эмоционального дискомфорта в условиях предъявления стрессогенной информации, является перцептивное избегание наркотических стимулов. Было установлено достоверное снижение количества и длительности зрительных фиксаций на сценах, связанных с употреблением героина, в условиях свободного рассматривания образной информации.

В экспериментальных условиях, блокирующих стратегию избегания, больные героиневой наркоманией демонстрируют нарушения перцептивной деятельности, проявляющиеся в «захватах» внимания и трудностях отвлечения от аспектов изображений, связанных с употреблением героина, что, в свою очередь, ведет к дезорганизации выполнения задач.

Анализ физиологических показателей выявил патологический феномен сужения диаметра зрачка на протяжении всего времени выполнения тестовых заданий, достоверно не являющийся следствием текущей интоксикации.

Анализ динамического показателя диаметра зрачка показал, что больные героиновой наркоманией демонстрируют сниженную способность к избирательной мобилизации когнитивных ресурсов в ответ на требования текущей задачи.

Предполагается, что полученные результаты могут лечь в основу разработки методологических принципов ранней психофизиологической

диагностики героиновой наркомании, новых методов психофизиологической коррекции.

Дисфункции когнитивного контроля на ранних и поздних стадиях переработки аффективной информации у больных с героиновой наркоманией (рег. № 8.23.458.2011).

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ГЕТЕРОХРОНИЯ КОГНИТИВНЫХ ПРОЦЕССОВ ПРИ ЗАСЫПАНИИ И НАРУШЕНИЯ ПРОФЕССИОНАЛЬНОЙ ДЕЯТЕЛЬНОСТИ

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Трудность создания эффективных приборов контроля уровня бодрствования операторов на транспорте и производстве связана со сложным динамическим характером взаимодействия физиологических систем бодрствования и сна при засыпании, а также с возникновением дремотных изменений состояния сознания, затрудняющих адекватную самооценку уровня бодрствования. Целью нашего исследования был анализ динамики взаимоотношений между ЭЭГ-показателями засыпания с психическими и моторными показателями выполнения психомоторной деятельности при последовательном снижении уровня бодрствования.

Мы использовали ранее разработанный нами монотонный психомоторный тест (Дорохов 1993–2000), со счетом про себя (без внешней стимуляции), выполняемый с закрытыми глазами, позволяющий очень быстро в течение 5–15 минут наблюдать кратковременные эпизоды «микросна» и связанные с ним нарушения психомоторной деятельности. Испытуемый, сидя в кресле или лежа на кушетке с закрытыми глазами, непрерывно считал от одного до десяти, одновременно сжимая кнопку правой рукой; затем без нажатия на кнопку считал от одного до пяти и т.д. Синхронно регистрировались: два отведения ЭЭГ (С3, С4), горизонтальные движения глаз, КГР, видеоизображение испытуемого, звук и нажатие кнопки. Количество испытуемых – 30 человек (мужчины), с хорошо выраженным альфа-ритмом ЭЭГ.

Показано, что правильное выполнение теста, с точным количеством нажатий – 10 отсчетов и отсутствием нажатий с временным интервалом, соответствующим 5 отсчетам, наблюдалось только на фоне преобладания альфа-ритма ЭЭГ. Отклонения от правильного выполнения теста, в большинстве случаев сопровождались возникновением дремотных и сонных паттернов в ЭЭГ. Незначительные нарушения деятельности начинались на фоне возникновения медленных горизонтальных движений глаз, характерных для начальной стадии дремоты – тета/дельта волны ЭЭГ.

Более значительные нарушения выполнения теста, с потерей правильности счета, выражающиеся в хаотичном нажатии на кнопку, сопровождались развитием паттернов ЭЭГ, характерных для второй стадии сна: сонные веретена, острые волны, К-комплексы, дельта волны.

Этот результат, с потерей правильности счета, но с сохраненной моторной компонентой можно трактовать как показатель возникновения дремотного изменения состояния сознания. По нашему мнению, именно возникновение такого состояния сознания является причиной аварий на транспорте, когда водитель полагает, что он находится еще в бодрствующем состоянии, но отдельные структуры его мозга уже достигли второй стадии сна, что можно объективно зарегистрировать по показателям электрической активности мозга. Таким образом, приборы контроля уровня бодрствования должны предотвращать попадание водителя в это опасное состояние, когда он еще способен автоматически управлять автомобилем, но функционирование его когнитивных функций уже нарушено и утрачена адекватная самооценка.

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КОГНИТИВНАЯ НАУКА И НБИК-КОНВЕРГЕНЦИЯ

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Конвергентное развитие НБИК (нанотехнологий, биотехнологий, информационных и когнитивных технологий) знаменует принципиально новый этап интеграции научных знаний. Эти четыре мегатехнологии оплодотворяют друг друга и создают небывалые, чрезвычайно мощные средства преобразования человека и социума, что влечет столь же масштабные риски и угрозы их существованию. Когнитивные технологии, как продукт когнитивных исследований, пока составляют наиболее узкое место в системе НБИК, хотя от них в существенной мере зависит возникновение новых направлений в развитии информационных технологий и общие результаты НБИК-конвергенции.

Разработка концептуального аппарата когнитивных исследований призвана выполнять ведущую роль в решении наиболее сложных междисциплинарных задач конвергентного развития НБИК. Это определяется тем, что именно когнитивная наука имеет прямое отношение к изучению психических процессов, сознания и социальных феноменов.

В ходе конвергентных процессов НБИК формируются интегральные объекты, описание и объяснение которых предполагают использование познавательных средств, специфичных для физических, химических, биологических, компьютерных, психологических и других наук, но вместе с тем требующих их соотнесения и объединения в некоторой общей концептуальной структуре. Более того, такого рода интегральные объекты явно или неявно содержат или предполагают социогуманитарные описания и объяснения. Речь идет фактически о *трансдисциплинарной* проблематике, охватывающей все основные разделы современного научного знания, в том числе гуманитарные и социальные дисциплины. К тому же развитие НБИК остро ставит проблемы социальной значимости этих процессов, их институционализации, способов управления ими. Отсюда необходимость включения в систему НБИК социогуманитарных нормативов и *социальных технологий*, которые призваны выполнять функции ценностной ориентации и регуляции, прогнозирования и экспертного санкционирования. Это дает основание говорить теперь не о системе НБИК (и соответствующей аббревиатуре, принятой в

научном сообществе более десяти лет тому назад), а о системе **НБИКС**.

Вопросы стратегии развития когнитивной науки должны рассматриваться поэтому в контексте системы НБИКС. Проблемы междисциплинарности, характерные для когнитивных исследований и разработки когнитивных технологий, наиболее ярко выражают ключевые вопросы и теоретические трудности интеграционных процессов в динамической системе НБИКС, взятой в целом. Их суть состоит в необходимости концептуального объединения двух классических типов научного описания и объяснения, один из которых является «физикалистским», естественнонаучным (опирается на понятия массы, энергии, пространственных отношений), другой – социогуманитарным (основывается на понятиях смысла, интенциональности, целеполагания, веры, воли и т. п.). Между этими видами понятий нет прямых логических связей. Для их объединения в единой научной системе описания и теоретического объяснения необходим концептуально обоснованный «мост». С середины прошлого века (в связи с успехами кибернетики, информатики, биологических дисциплин, ряда других областей знания, в том числе когнитивных исследований) получил значительное развитие *метатеоретический уровень научного знания*, благодаря которому появились возможности построения указанного концептуального «моста».

Одна из таких весьма перспективных возможностей связана с разработкой *информационного подхода*. Понятие информации допускает не только формальное (синтаксическое), но и семантическое и прагматическое описание, а потому способно выражать основное содержание понятий социогуманитарного типа (смысла, ценности, цели и т. п.), а с другой стороны, в силу кодовой воплощенности информации в своем материальном носителе, оно требует «физикалистского» описания (включая понятия массы, энергии и т. п.). Отношение между информацией и ее носителем является *функциональным*. Анализ этого отношения раскрывает специфический (отличный от причинно-следственного) вид связи, при которой информация и ее носитель выступают как явления одновременные и однопричинные. Тем самым задается особый способ теоретического объяснения (отличный от сугубо физикалистского), предметом которого является *кодовая зависимость* (ее образование, функционирование, нарушение, распад), и ставится *задача расшифровки*

кода. Такая задача является центральной при исследовании связи явлений субъективной реальности с мозговыми процессами (и разработке столь значимой для когнитивной науки и для всего конвергентного развития НБИКС проблемы «сознание и мозг»); она является ключевой при изучении акта коммуникации. Задача расшифровки кода существенно отличается от классических задач естествознания, так как включает коммуникативный и герменевтический аспекты, предполагает опору на категорию *понимания*. Она требует привлечения познавательных средств лингвистики и криптологии.

Информационный подход – одно из следствий развития парадигмы функционализма, суть которой состоит в признании логической независимости описания и объяснения функциональных отношений от описания и объяснения физических отношений, следовательно, невозможности редукции первых ко вторым, а тем самым в обосновании принципа изофункционализма систем, т. е. возможности множественной физической реализации одной и той же функции. Это подтверждается принципом инвариантности информации по отношению к физическим свойствам ее носителя. Идея функционализма служит теоретическим базисом когнитивной науки, и она же лежит в основе создания любой *технологии*, как способа эффективного действия. В этом проявляется глубинная связь когнитивной науки со всей системой НБИКС.

Информационный подход широко и продуктивно используется в биологических,

психологических, нейронаучных, генетических, лингвистических, социальных исследованиях, не говоря уже о компьютерных дисциплинах и всей области информационных технологий. Его интегративные возможности хорошо проявились в области когнитивной науки, стремящейся объединять результаты перечисленных областей исследований в единой объяснительной модели. Необходимо подчеркнуть роль когнитивной науки в разработке проблемы сознания, которая выступает ценностно-смысловым эпицентром развития НБИКС. Проблема сознания, взятая во всех ее главных аспектах, представляет ядро проблемы человека, и сквозь ее призму мы пытаемся рассмотреть, прояснить экзистенциальный смысл, антропологическую перспективу, ущербность или, быть может, экзистенциальный абсурд развития НБИКС.

В этом отношении проблема сознания пока еще недостаточно исследуется в рамках когнитивной науки. В ней всё еще слишком распространены редукционистские варианты функционализма, упрощенные модели сознания, из которых изымается качество субъективной реальности (когда оно не выделяется как специальный объект исследования, берется слитно с поведенческими и речевыми актами). Развитие когнитивной науки в контексте НБИКС настоятельно требует более широкого и эффективного исследования проблемы сознания, более основательного учета ценностного, действенно-волевого и экзистенциального аспектов сознания при изучении познавательных процессов.

КОГНИТИВНЫЕ МЕХАНИЗМЫ СМЕШНОГО (НА МАТЕРИАЛЕ АНЕКДОТОВ)

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Исследования, проводимые в области юмора в последние годы, показали, что это чрезвычайно сложный и многогранный феномен и что в поисках ответов на вопросы, возникающие в ходе его изучения, необходимы объединенные усилия специалистов в различных областях знания. Интерес к когнитивной лингвистике как науке, способной внести значительный вклад в прояснение проблемы смешного, в последнее время растет, что объясняется ее парадигмальными преобразованиями — смещением интереса с внешне представленных содержательных структур языка на глубинные познавательные процессы, протекающие в сознании его носителя. С этих позиций механизмы смешного способны получить новое, более глубокое объяснение.

Начало подобным новым исследованиям в области смехового текста было положено работами А. Греймаса (теория дизъюнктивной изотопии), А. Кёстлера (бисоциативная модель) и Дж. Милнера (семиотическая теория юмора и смеха). Их теории, лежащие в русле структурализма и семиотики, были связаны с попытками объяснить, каким образом возникает не просто двусмысленность, но двусмысленность особая, порождающая несоответствие или противоречие, и каким образом нарушенное в тексте соответствие восстанавливается. Выраженные ими идеи стимулировали интерес исследователей к вербальному юмору.

Еще более далеко в этом направлении продвинулись авторы общей теории вербального юмора В. Раскин и С. Агтардо. Уделив особое внимание репрезентации смехового текста, они пришли к выводу: для того, чтобы построить текст анекдота, рассказчику приходится преодолевать шесть ступеней, начиная с наблюдения за действительностью и определения актуальных в данном случае семантических оппозиций до выбора языковых средств описания ситуаций, реализующих эти оппозиции. При этом выбор языковых средств особенно важен при передаче шуток, поскольку язык «несет ответственность» за выражение содержания анекдота.

С точки зрения успешности представления анекдота, особое значение имеют навыки построения и речевой реализации текстов подобного рода со стороны рассказчика. Однако еще

более важной является способность слушателя интерпретировать этот текст, раскрыть его семантический и культурный потенциал, но главное — выявить имплицитно содержащееся в нем игровое начало. В акте интерпретации анекдота, в тех когнитивных усилиях, которые слушатель прилагает для гармонизации парадоксального противоречия, возникающего в результате несоответствия между ситуацией, описанной в его начале, и ситуацией, интерпретируемой в конце, состоит творческая деятельность слушателя.

Стратегия интерпретации анекдота имеет нелинейный характер. В соответствии с представленной в его начале ситуацией слушатель выстраивает в своем сознании определенную когнитивную модель, базируясь на содержании собственного опыта и результатах процесса познания. Столкнувшись с кульминационным пунктом анекдота, он проводит процесс повторной интерпретации, пытаясь обнаружить признаки языковой игры, которая, собственно, и приводит в соответствие обнаруживающиеся в нем содержательные несоответствия. Конечные модели интерпретации, выбираемые слушателем, находятся в зависимости от его языковой компетенции, фоновых знаний и контекста анекдота. Особую роль в ряду этих стратегий играет инференция, процесс, в котором, опираясь на знания языка и знания о мире, слушатель выстраивает связность текста, восстанавливает причинно-следственные связи и извлекает новое содержание, сводящееся к репрезентации ситуаций, описанных текстом.

Анекдоты представляют собой тексты особого рода, которые обладают специфической структурой. В соответствии с разработанной В. Раскиным семантической теорией юмора, основанной на скриптах, анекдот должен содержать два частично или полностью совместимых скрипта, согласующихся с текстом как целым. Раскин рассматривает скрипты как формализованные семантические сущности, являющиеся результатом семантического анализа текста и его лингвистического контекста. При обращении к анализу анекдотов с когнитивной точки зрения, предпочтение отдается терминам «внеязыковая ситуация», «содержательная реальность». Перефразируя положение, сформулированное В. Раскиным, можно утверждать, что анекдот должен содержать две полностью или частично совместимые ситуации (или содержательные реальности), согласующиеся с текстом.

Наличие двух содержательных реальностей в пределах короткого текста определяет

структуру анекдота, в которой выделяются два структурных типа. Тип *последовательности*, в котором реальности вводятся последовательно, и обращение слушателя ко второй реальности следует за осмыслением первой. В этом случае реальности совместимы с текстом частично. Второй структурный тип – тип *одновременности*. В нем альтернативные содержательные реальности налагаются друг на друга, то есть их конфликт происходит в пределах общего контекста. В анекдотах второго структурного типа реальности полностью совместимы с текстом.

Интерпретация двух отмеченных содержательных реальностей становится возможной благодаря логическому механизму, роль которого в

анекдоте в большинстве случаев играет триггер. В анекдотах без такого триггера запуск игровых когнитивных механизмов осуществляется под действием внутренних факторов ментального характера, в числе которых – готовность субъекта к восприятию игры смыслами, способность формировать в своем сознании ситуации, описанные в данном анекдоте и способные вступать в отношения альтернативы друг к другу.

Таким образом, интерпретация анекдотов непосредственно связана с когнитивным уровнем и интеллектуальным потенциалом слушателя/читателя, а процессы когнитивного постижения анекдота требуют от него приложения определенных когнитивных усилий.

ОСОБЕННОСТИ ПРИНЯТИЯ РЕШЕНИЙ ЛЮДЬМИ РАЗНЫХ ПСИХОЛОГИЧЕСКИХ ТИПОВ

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Популярность постюнговских типологий, разработанных в США (типологии, использующие опросники Майерс-Бриггс, Кейрси и др.) и в СССР (соционика, созданная Аушрой Аугустивиначюте), вызвана тем, что Юнг, задолго до появления информатики как самостоятельной научной дисциплины, рассмотрел человеческую психику с точки зрения того, как человек получает, перерабатывает и использует полученную информацию. Если воспользоваться языком современной информационной теории, то выяснится, что выделенные Юнгом четыре психические функции, формирующие эктопсихическую (внешнюю) систему психики человека, служат:

Ощущение (сенсорика) – для получения информации через органы чувств.

Мышление (логика) – для анализа полученной информации.

Чувство (этика) – для оценки значения этой информации для получающего ее человека.

Интуиция – для обобщения полученной информации, установления ее связи с прошлым опытом и ее значения для будущего.

В скобках я привел альтернативные названия, которые дала трем из четырех психических функций Юнга Аушра Аугустивиначюте, на мой взгляд, лучше передающие их сущность, именно ими я буду пользоваться в дальнейшем.

Юнг разделил 4 функции на 2 пары: иррациональную, связанную в большей степени с бессознательным (сенсорика и интуиция) и рациональную, связанную в большей степени с сознанием (логика и этика). При этом он подчеркивал, что функции находятся между собой в своеобразном противостоянии, они конкурируют друг с другом и особенно очевидна конкуренция между собой иррациональных и рациональных пар.

Юнг рассмотрел также 2 установки: экстравертную и интровертную. Он считал, что каждая из 4-х психологических функций может существовать в двух вариантах: экстравертном и интровертном, и человеку для успешного функционирования необходимы все 8 функций. То, какая из этих функций развита у человека сильнее других, определяет отнесение его к определенному психологическому типу, причем в соционике используется введенный в психологию Антоном Кемпинским, на мой взгляд, очень удачный термин «тип информационного метаболизма» (ТИМ). Очевидно, что то, какие функции сильны, а какие слабы у человека определенного ТИМа, во многом определяет способ, которым он принимает решения, и те ошибки, которые он склонен совершать.

Рационал принимает решение взвешенно и обдуманно и принятому решению следует, но может слишком «разумно» подойти к ситуации и упустить подвернувшийся шанс в условиях, требующих спонтанной реакции.

Иррационал действует, быстро учитывая изменение ситуации, но может по торопливости

принять необдуманное решение, о котором в дальнейшем придется жалеть.

Экстраверт при принятии решения основывается на учете внешних обстоятельств и склонен действовать активно, но может под влиянием внешних обстоятельств принять решение, противоречащее собственным внутренним установкам.

Интроверт при принятии решения основывается на собственных установках, может проигнорировать разумные советы и, из упрямства поступив по-своему, совершить ошибку.

Сенсорик учитывает реальное положение дел, принятое решение воплощает в жизнь без излишних колебаний, но может не заметить перспективного варианта, не почувствовав ситуацию в целом и ее возможное развитие.

Интуит при принятии решения может представить ситуацию в целом и принять правильное решение, к которому трудно придти, основываясь только на фактах, лежащих на поверхности, но склонен к сомнениям и колебаниям, может не учесть реальных трудностей, которые возникнут при реализации принятого решения.

Логик принимает решение, тщательно проанализировав ситуацию, но может не учесть того, как принятое решение будет воспринято другими людьми.

Этик может оценить то, как его решение будет воспринято окружающими, но склонен принимать решение под влиянием симпатий и антипатий, но может не учесть важных обстоятельств, требующих тщательного анализа.

Можно также определить роль различных психических функций в принятии решений:

Экстравертная сенсорика (восприятие окружающего мира органами чувств, вызывающее стремление к активным действиям) помогает принимать волевые решения и энергично проводить их в жизнь.

Интровертная сенсорика (восприятие своих ощущений от соприкосновения с окружающим миром) помогает принимать решения, учитывающие реальное положение дел и в то же время «удобные» для себя и других людей.

Экстравертная интуиция (восприятие потенциальных возможностей человека, объекта, ситуации) помогает принимать оригинальные решения, основанные на новых идеях и учитывающие скрытые возможности ситуации.

Интровертная интуиция (восприятие внутренних скрытых процессов, которые в

будущем могут привести к заметным изменениям) помогает учитывать при принятии решения предыдущий опыт и предчувствовать будущие события.

Экстравертная логика (познание объективной фактической информации и закономерностей, знания и умения) помогает принимать разумные эффективные решения, основанные на анализе ситуации, и по-деловому их реализовывать, мобилизуя окружающих.

Интровертная логика (осмысление и анализ информации, ее структурирование и классификация, формирование выводов из предпосылок) помогает принимать решения, отличающиеся логикой и внутренней согласованностью.

Экстравертная этика (эмоциональная оценка объекта, человека, ситуации) помогает принимать решения и проводить их в жизнь, учитывая и используя чувства и настроения других людей.

Интровертная этика (собственное отношение к объекту, человеку, ситуации) помогает принимать решения, отвечающие принятым человеком моральным критериям.

Как показывает мой многолетний опыт чтения курсов «Теория принятия решений», «Разработка управленческих решений», «Управление персоналом», «Основы теории экономического риска», соционический подход, очищенный от ряда своих догматов (обязательная принадлежность человека к определенному психологическому типу, неизменному на протяжении всей жизни человека, отсутствие смешанных типов и др.), помогает студентам находить правильные оптимальные решения (Ельяшевич, 2009).

Ознакомление студентов с основными идеями соционики, основанное на сочетании логического и образного подходов, позволяет достигнуть лучшего понимания индивидуумом своих сильных и слабых сторон и осознания необходимости учета того, какие ошибки могут быть допущены им при принятии решения, а также того, какие отношения могут установиться между людьми разных ТИМов при совместной деятельности и какие при этом могут возникнуть конфликты, вызванные разным восприятием информации и разными подходами к ее анализу, оценке и использованию.

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ВЛИЯНИЕ ДВИЖЕНИЙ ГЛАЗ И СЛОЖНОСТИ ЗРИТЕЛЬНОЙ СРЕДЫ НА АМПЛИТУДУ ЭЭГ В ДИАПАЗОНЕ АЛЬФА-РИТМА

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Зрительное селективное внимание тесно взаимосвязано с движениями глаз. Фокусируя своё внимание произвольно на некотором зрительном объекте, человек, как правило, перемещает взор таким образом, чтобы объект проецировался на фовеа – область сетчатки, обеспечивающую предметное зрение. События могут происходить и в обратной последовательности: перемещение взора на некоторый объект может быть осуществлено непроизвольно (например, если объект сильно отличается от окружающей его зрительной среды по каким-либо физическим свойствам), и фокус произвольного внимания переместится на объект уже после того, как на нём будет совершена фиксация взора. В реальных условиях описанные процессы зачастую происходят параллельно, что приводит к суперпозиции их электрографических коррелятов. В настоящей работе мы предприняли попытку выявить специфические корреляты активности произвольного и непроизвольного зрительного внимания в условиях сложной зрительной среды, требующей совершения движений глаз. Известно, что активность внимания в значительной степени отражается в амплитуде колебаний ЭЭГ в альфа-диапазоне (8–13 Гц), а именно, в активных в определенный период областях коры наблюдается снижение амплитуды (десинхронизация), а в подавляемых ими других областях, напротив, увеличение амплитуды (синхронизация) колебаний ЭЭГ в альфа-диапазоне (Klimesch et al., 2007). Поэтому в качестве параметра, отражающего вовлечение внимания, мы выбрали вызванную десинхронизацию в этом диапазоне.

Основой нашего исследования стала парадигма зрительного поиска (ЗП). Испытуемым предъявляли изображения, содержащие 45–57 стимулов, один из которых (релевантный, РС) отличался от других (нерелевантных, нРС) по форме (рис. 1).

Момент нахождения РС мы определяли на основании трекинга взора методом видеоокулографии с дополнительной регистрацией электроокулограммы. Относительно этого момента производили усреднение ЭЭГ по алгоритму Г. Пфуртшеллера (Pfurtscheller, Aranibar, 1977)

и анализировали динамику амплитуды ЭЭГ в частотном диапазоне альфа-ритма. В качестве одной из контрольных задач мы использовали парадигму «активный одд-болл» (ОБ), в которой стимулы предъявляли по одному. РС предъявляли в 10% случаев. Испытуемых инструктировали считать РС. В ОБ все стимулы предъявляли в центре экрана, поэтому совершать движения глаз в этом случае не требовалось. ЭЭГ усредняли относительно момента предъявления стимула. Другим контролем была экспериментальная парадигма «белый экран», в которой испытуемым предъявляли экран без каких-либо зрительных объектов. Испытуемых инструктировали фиксировать взор на произвольных областях экрана, «рассматривая» его. Усреднение производили относительно начала фиксации на произвольных областях белого экрана.

Фиксирование взора как на РС, так и на нРС в парадигме ЗП, а также включение РС и нРС в парадигме ОБ приводило к развитию десинхронизации ЭЭГ в альфа-диапазоне. В парадигме «белый экран» такого эффекта не было. Десинхронизация в парадигме ЗП отмечалась во всех отведениях, но наибольшей выраженности достигала в лобных и центральных. В парадигме ОБ, напротив, в лобных и центральных отведениях десинхронизация отсутствовала, но в

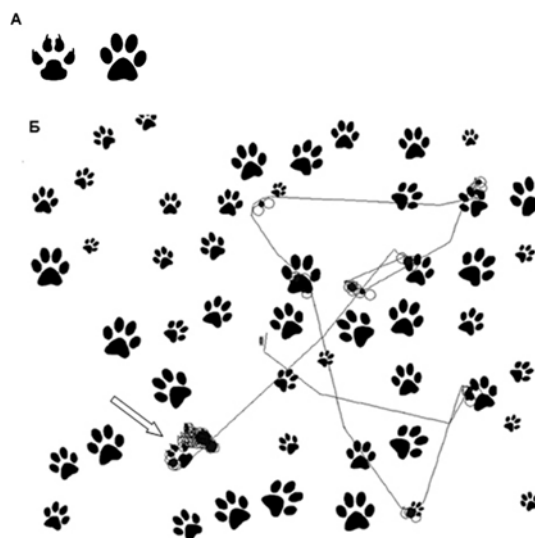


Рис. 1. А – стимулы, используемые в экспериментах; слева – РС, справа – нРС. Б – пример тестового изображения с набором стимулов; стрелкой отмечен РС. Линиями обозначены саккады, а кружками – фиксации взора, регистрируемые при поиске РС

теменных и затылочных была выражена практически в той же степени, что и в парадигме ЗП. Значимость стимула также оказывала влияние на выраженность десинхронизации. Так, в парадигме ЗП во всех отведениях амплитуда потенциалов ЭЭГ на частоте 8–13 Гц снижалась в большей степени при нахождении РС (в парадигме ЗП), чем при фиксации взгляда на таком же по форме стимуле в контроле (последовательные фиксации на 4-х стимулах). В парадигме ОБ амплитуда потенциалов ЭЭГ в альфа-диапазоне в ответ на стимулы снижалась только в теменных и затылочных отведениях, причем реакции в ответ на РС оказались значимо больше, чем реакции в ответ на нРС.

Мы предполагаем, что различия в выраженности десинхронизации в лобных и центральных отведениях в парадигмах ЗП и ОБ могут быть следствием существенно большей сложности задачи ЗП. Успешное завершение поиска (нахождение РС) вызывает значительное изменение функционального состояния человека (в частности, изменение активности произвольного внимания), что выражается в снижении амплитуды потенциалов ЭЭГ в альфа-диапазоне в лобных и центральных отведениях. Предъявление нРС в парадигме

ОБ или совершение на нём фиксации в парадигме ЗП приводили к развитию десинхронизации в теменных и затылочных отведениях, что, в соответствии с данными литературы (Fox et al., 2006), можно интерпретировать как отражение активности непроизвольного внимания. Однако произвольное модальное-специфическое внимание может усиливать степень десинхронизации, как видно из различий между предъявлением/нахождением РС и нРС. При этом развитие десинхронизации не является следствием совершения движений глаз, даже если эти движения совершаются произвольно и целенаправленно, поскольку в парадигме «белый экран» десинхронизации не наблюдалось.

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КОГНИТИВНОЕ КАРТИРОВАНИЕ В ЗНАКАХ ЯЗЫКА

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Под когнитивным, или ментальным, картированием в широком смысле понимается мысленное представление человеком окружающего его мира. Когнитивное картирование включает различные психологические процессы, связанные с восприятием, кодированием, хранением, декодированием и использованием информации о мире. Получаемые в результате когнитивные карты, или ментальные репрезентации, по своей природе неполны и наделены некоторыми искажениями, девиациями, что становится очевидным при воплощении когнитивных карт в некоторой материальной форме (Downs and Stea 1973). Задаваемая когнитивной картой информация о мире неизбежно остается *субъективным* образом, *моделью* мира, его *интерпретацией* (construal), которую не следует отождествлять с самим миром. То есть «карта – это не территория», равно как и «меню – это не еда» (Уилсон

2000: 9). Целью данного доклада является показ того, что при наличии триады «внешний мир – мышление – язык» операция картирования является основополагающей не только для мышления, но и для связанной с ним системы языковых знаков.

Внешний мир → мышление / значение языкового знака. Картирование, понимаемое как неполное и зачастую девиантное (отклоняющееся от действительного положения дел) отражение объекта восприятия, есть продукт внимания, которое выделяет не все, а лишь определенные фрагменты наблюдаемого. Согласно Л. Телми (Talmy 2000: 76–77), такие фрагменты, взятые совокупно, образуют паттерны внимания. Благодаря фокусировке той или иной составляющей паттерна возникают различные варианты его картирования на одну и ту же референтную сцену. Так, в ситуации *Продавец продал вазу покупателю* в фокусе пребывает продавец, а в ситуации *Покупатель приобрел вазу у продавца* – покупатель (Talmy 2000: 76–77). В когнитивной грамматике Р. Ленекера эти различия связываются с операцией соположения траектора и

ориентира (trajector/landmark alignment), соответствующих первичному и вторичному семантическим фокусам, которые в равной степени необходимы для понимания значения языкового выражения (Langacker 2008: 70–73). Таким образом, когнитивное картирование предопределяет как саму концептуальную структуру, задаваемую паттерном внимания, так и преобразование этой структуры, зависящие от ментальных операций с ней. Концептуальная структура и ее трансформации влияют на **значение** языкового знака (слова, словосочетания, предложения или текста), то есть на ту информацию, которую этот знак активирует в мышлении.

Значение языкового знака → сам языковой знак / внутренняя форма. Сам языковой знак, предназначенный для **обозначения**, для активации значения как присутствующей в мышлении информации, на стадии своего создания, как правило, связан со своим значением, то есть мотивирован. При этом мотивация отслеживается по линии внешней и внутренней формы знака. **Внешней формой** является звуковая оболочка знака, а **внутренней формой** становится фрагмент значения, представленный во внешней форме (ср. Потебня 1993: 100; Кубрякова 2004: 62). Иконическая связь значения с внешней формой знака проявляется в ониматопеях (типа *шипеть*, *жуужжать*, *крякать*) и звуковом символизме (к примеру, звук [о] ассоциируется с круглым предметом: *клоп*, *кнопка*). Связь же значения с внутренней формой знака проявляется в картировании как фрагментарном, неполном представлении значения. К примеру, фрагменты информации, содержащейся в концепте МЕДВЕДЬ, объективированы во внутренней форме языковых единиц *медведь* (мёд едящий), *топтыгин*, *косолапый*, *хозяин тайги* (см. подробно в Жаботинская 2003). Девиациями, отклонениями от реального положения дел, получающими отражение во внутренней форме языкового знака, можно считать метафоры (*лев* = храбрый человек) и контрфактивы – оксюморон (*ужасно красивый*) и иронию (*умник* = дурак).

Языковой знак: внутренняя форма → внешняя форма. Внутренняя форма языкового выражения получает материальное воплощение в его внешней форме. При этом имеет место картирование, проявляющееся во фрагментарности и девиантности внешней формы знака. Так, в частности, внутренняя форма слова и словосочетания структурируется с помощью ономаσιологической модели, которая включает: а) ономаσιологический базис, или целевое понятие, б) ономаσιологический признак как характеристику базиса, в) связку, демонстрирующую

тип отношения между базисом и признаком (Кубрякова 2004). Базис и признак ономаσιологической модели аналогичны траектору и ориентиру как первичному и вторичному семантическим фокусам (Жаботинская 2010). Ономаσιологическая модель может быть явлена во внешней форме знака полностью (*кофеварка* = машина варит кофе) или фрагментарно: опускается либо связка (*сороконожка* = насекомое имеет сорок ног), либо связка и базис (*косолапый* = медведь есть косолапый). Ср. также компрессию формы: *пятирублевая банкнота* > *пятирублевка* > *пятерка*; *англ. three-piece suit* > *three-piecer* > *threer* > *(the) three*. К явлениям этого же порядка можно отнести и различные случаи компресии предикативной структуры предложения: *Наступила зима* > *Зима*; *Он пришел* > *Пришел*. Девиантность внешней формы, ее существенное отклонение от внутренней формы знака, отслеживается в единицах типа *веселые цены* (цены, которые делают человека веселым). Здесь ономаσιологическая модель, структурирующая внутреннюю форму языкового знака, содержит сложный признак, представленный пропозицией (человек есть веселый), где опускается логический субъект (человек), и характеризующий его предикат (веселый) присоединяется к ономаσιологическому базису (цены), не будучи при этом его непосредственной характеристикой. К девиантности формы относятся, по всей вероятности, и рассматриваемые в лингвопрагматике имплицатуры – конвенциональные (*Она красива, но не замужем*) и конверсационные (А. *Ты знаешь новость?* – Б. *Я был в командировке*).

Картирование как фрагментарное представление внутренней формы языкового знака в его внешней форме отслеживается и в таких языковых феноменах, как аббревиация, гаплоглогия, телескопия и грамматикализация.

В итоге, можно предположить, что когнитивное картирование предопределяет сам факт появления знаков языка. Если мышление картирует мир (фрагментарно и зачастую девиантно отражает информацию о нем), то язык картирует мысль. При этом внешняя форма языковых единиц картирует их внутреннюю форму.

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ДВОЙНЫЕ ЗАДАЧИ – ИНДИКАТОР КОГНИТИВНЫХ ВОЗМОЖНОСТЕЙ ЧЕЛОВЕКА В УСЛОВИЯХ ИНФОРМАЦИОННЫХ НАГРУЗОК

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В современном обществе в условиях усложненной информационной среды внимание исследователей в различных областях науки привлечено к изучению механизмов взаимодействия афферентных потоков и особенностей их обработки мозгом здорового человека и пациентов с патологией ЦНС. Для изучения особенностей работы мозга человека в этих условиях используются различные экспериментальные ситуации, к которым можно отнести так называемые двойные задачи (dual-tasks), в которых сочетается выполнение моторных и когнитивных составляющих. Целью настоящего исследования явилось изучение нейрофизиологических механизмов, обеспечивающих индивидуальные особенности успешности выполнения двойных задач здоровыми людьми и пациентами с последствиями черепно-мозговой травмы (ЧМТ). У 20 здоровых испытуемых и 14 пациентов с последствиями ЧМТ проведено мультидисциплинарное электроэнцефалографическое (ЭЭГ), нейропсихологическое (у пациентов – количественные клинические шкалы МРАИ и FIM) и стабิโลграфическое исследование с изолированным и одновременным выполнением моторных (произвольный позный контроль) и когнитивных (счет) задач. У здоровых людей выявлены стабิโลграфические маркеры успешности выполнения двойных задач – низкая скорость перемещения общего центра давления и его амплитуда во фронтальной

плоскости. Нейропсихологические исследования показали, что наиболее успешно выполнению двойных задач соответствуют большие когнитивные резервы, включающие объем памяти, внимания и высокую скорость его переключения. ЭЭГ-исследования выявили специфические регионарно-частотные реактивные перестройки при выполнении моторного компонента в виде увеличения когерентности альфа-бета-диапазона для дистантных пар отведений в правом полушарии и теменных областях, а когнитивного – медленных составляющих ЭЭГ с большим включением левого полушария и лобных областей коры. У испытуемых, успешно выполнявших двойные задачи, наблюдалось включение регионарно-частотных составляющих ЭЭГ обоих компонентов с элементами автоматизма выполнения моторного компонента, что создавало условия для распределения когнитивных ресурсов на выполнение обоих компонентов двойных задач. У пациентов с ЧМТ выявлены разные варианты реактивных перестроек ЭЭГ, обусловленные тяжестью поражения мозга и позволяющие выявить перспективы его адаптации к сложной социальной среде. Таким образом, двойные задачи могут быть использованы как индикатор оценки возможностей функционирования здоровых людей и пациентов, с последствиями ЧМТ в условиях информационных нагрузок. Выявлена определяющая роль когнитивных ресурсов, а также специфические ЭЭГ-маркеры, отражающие особенности интегративной деятельности мозга здоровых людей и пациентов с ЧМТ в условиях усложненной информационной среды.

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ОКУЛОМОТОРНАЯ АКТИВНОСТЬ ПРИ ВЫПОЛНЕНИИ ИДЕНТИФИКАЦИИ ПЕРИФЕРИЧЕСКИ ЭКСПОНИРУЕМЫХ ИЗОБРАЖЕНИЙ ЭКСПРЕССИЙ ЛИЦА

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Задачей данного исследования было уточнение предельных условий, при которых возможна идентификация базовых экспрессий лица. Обязательна ли в этом случае хотя бы одна фиксация на изображении и если да, то какова ее минимальная продолжительность? Насколько в данном случае широки границы периферического восприятия?

В качестве стимульного материала были использованы фотоизображения базовых экспрессий лица их набора POFA II. Экмана – радость, гнев, страх, удивление, горе, отвращение, спокойное лицо; угловые размеры $4.6^\circ \times 6.6^\circ$. Изображения экспонировались по центру экрана, а также со смещением влево, вправо, вверх и вниз; величина смещения 2.5° , 5° , 7.5° , 10° . Таким образом, каждому значению смещения соответствовало 28 экспериментальных ситуаций (7 экспрессий \times 4 направления смещения). Время экспозиции изображений составляло 200 мс. Предъявлению каждого изображения предшествовала центральная фиксационная точка, на которой наблюдатель должен был непрерывно удерживать взор в течение 1 с. После предъявления изображения на 1 с показывалась шумовая маска, а затем показывался экран выбора, на котором по кругу были показаны все фотоизображения, используемые в эксперименте. От испытуемого требовалось щелкнуть мышкой по тому фотоизображению, которое только что было ему показано. Регистрация движений глаз выполнялась с помощью айтрекера SMI High Speed монокулярно, частота регистрации 500 Гц. В эксперименте участвовало 36 человек – студенты московских вузов и сотрудники Центра экспериментальной психологии МГППУ.

Средние значения точности ответов по сериям составляют .89, .89, .87, .84, .77 соответственно. Таким образом, с усложнением условий экспозиции происходит нелинейное снижение точности решения, значимые отличия наблюдаются при смещении 7.5° – 10° . При этом изменения в точности опознания отдельных экспрессий происходят неоднозначно. Точность опознания спокойного лица для разных условий экспозиции

остается неизменной (.8 – .88). Для экспрессии радости максимальная точность опознания (.92) достигается при угловом отклонении 7.5° . Точность опознания остальных экспрессий монотонно снижается с усложнением условий экспозиции.

Лучше всего опознаются фотоизображения экспрессий удивления (.90), гнева (.88), отвращения (.90). Несколько хуже – фотоизображения спокойного лица (.84) и радости (.85). Хуже всего – фотоизображения горя (.79) и страха (.80). Анализ структуры ответов позволяет выделить два основных комплекса экспрессий, смешиваемых наблюдателями: «спокойное выражение – горе – отвращение» и «удивление – гнев – страх». При экспозиции фотоизображения «радость» наблюдатели часто дают «ошибочные» ответы «страх».

Анализ точности ответов в зависимости от направления углового смещения показал, что точность ответов при смещении изображения влево (.89) и вправо (.91) значимо не отличается от точности ответов для несмещенных изображений (.89). Точность ответов при смещении изображений вверх (.83) и вниз (.75) значимо ниже, чем для несмещенных изображений.

Наличие саккады в направлении объекта связано с его отклонением от центра экрана. Для изображений, выводимых в центр экрана, саккады практически отсутствовали. При угловом смещении в 2.5° доля ситуаций, в которых наблюдались саккады, составила .81. При большем угловом отклонении доля ситуаций, в которых наблюдались саккады, составила .90 – .92. В случае смещения изображений влево и вправо доля ситуаций, в которых наблюдались саккады, составляла .89 – .91. Для изображений, смещенных вверх, доля ситуаций с саккадами составляла .83, для изображений, смещенных вниз – .75. Медианная латентность саккад уменьшается с увеличением углового отклонения и составляет 164 мс, 150 мс, 144 мс, 142 мс соответственно.

При угловых отклонениях 2.5° – 7.5° латентность саккад не зависит от изображения экспонируемой экспрессии. В случае изображений, экспонируемых с угловым отклонением 10° , минимальная латентность саккад связана с экспозицией изображений спокойного лица (медианное значение латентности 134 мс) и радости (138 мс). Для остальных экспрессий латентность саккад по сравнению со спокойным лицом более

продолжительна (различия значимы на уровне $p < .01$): отвращение – 141 мс; страх – 144 мс; горе, удивление, гнев – 146 мс.

Объяснение полученных результатов требует более подробного изучения ранних стадий перцептогенеза экспрессий лица. Возможно, что для разных экспрессий она может проходить в разном темпе, причем некоторые «базовые» по П. Экману могут объединяться в более общие комплексы. Меньшая латентность саккад для периферически предъявляемых с угловым отклонением 10° изображений спокойного лица и радости, по сравнению с изображениями остальных базовых экспрессий, позволяет предположить, что дифференцировка «спокойное лицо / экспрессия» и предварительная дифференцировка экспрессий в данном случае совершаются до выполнения саккады, основываясь на информации, получаемой периферическим зрением.

Анализ точности решения задачи в зависимости от углового смещения предъявляемых изображений и наличия саккады в направлении экспонируемого изображения показал, что при отсутствии саккады эффективность решения задачи существенно снижается, однако даже при угловом отклонении в 10° в отсутствие саккад наблюдатели дают 47% верных ответов. Всего

при угловом отклонении 10° зафиксировано 100 экспериментальных ситуаций (из 1008), в которых отсутствовала саккада на экспонируемое изображение. Из них в 47 ситуациях наблюдателями были даны верные ответы, в 53 – неверные. Таким образом, наличие саккады в направлении периферически экспонируемого фотоизображения экспрессии не является ни необходимым, ни достаточным условием ее правильного опознания. Даже в оптимальных условиях экспозиции наблюдатели дают 10% неверных ответов. В то же время зафиксированы случаи, когда наблюдатель правильно идентифицирует фотоизображение, предъявляемое с угловым смещением вплоть до 10° , не выполняя саккады. В дальнейших исследованиях было бы интересно детально интересно изучить, насколько эффективно происходит идентификация периферически предъявляемых изображений экспрессий при невозможности выполнения саккады. Для этого достаточно уменьшить время экспозиции с 200 мс до 150 мс, тем самым делая его сопоставимым со средней латентностью саккад.

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ШИРОКОЗНАЧНОСТЬ – ИЗМЕНЕНИЕ ОБЪЕМА ПОНЯТИЯ

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В лингвистических исследованиях последних лет большое внимание уделяется такому явлению, как широкозначность. Интерес к нему возник с появлением работы Н. Н. Амосовой (1963), и на протяжении нескольких десятилетий вопрос о том, в чем отличие многозначности от широкозначности, продолжает волновать лингвистов. Авторы исследований подходят к этой проблеме с различных точек зрения. Рассуждая о типологии концептуальной сложности, ее запутанности, Круз А. выделяет несколько базовых понятий (thing, stuff) и относит их к простейшим концептам (2008: 48). Попытки описать эту проблему с когнитивной точки зрения находим у О. К. Ирисхановой. По мнению О. К. Ирисхановой, дефокусирование – выделение референтной нечеткости лексических единиц – «приводит к их способности

указывать на достаточно широкий класс объектов или событий, обладающий размытыми границами» (2010: 78–79). З. Ковешеч говорит о приоритете полного значения слова (full meanings) над остальными (minimal meaning) (2010:247). Следует ли понимать полное значение как широкозначное?

Многозначность (полисемия) – это языковое явление, когда одно наименование\обозначение ассоциируется с двумя и более значениями, которые оказываются связанными между собой. Широкозначность (эврисемия) – по определению М. В. Никитина – наличие у слова «ненормативно большого числа значений» (2005: 105). Возьмем английское слово «head». Словарь ABBYY Lingvo x3 приводит следующие значения существительного «head»: 1) голова; жизнь (=сложил голову за что-то); 2) ум, интеллект; 3) о титуле, повышении по службе; 4) лицевая сторона монеты; 5) количество голов скота; 6) о возрасте животного (of the first head); 7) верхушка, верхняя часть чего-то; 8) верхняя часть растения (крона дерева, кочан капусты, колос);

9) газетный заголовок, заглавие; 10) пена (на пиве, молоке); 11) головка фурункула, нарыва; 12) исток, верховье реки; 13) насыпь, верхний уровень плотины; 14) головная часть процессии, колонны; 15) вершина – отрезок фразы с ядерным тоном; 16) носовая часть судна; 17) глава, руководитель; 18) результат, исход, выходящая точка. В этот далеко не полный перечень не включены жаргонные употребления: напр., галюн, туалет на судне; название некоторых частей тела и др.) Что общего, что объединяет выше приведенные значения существительного «head»?

Возможно, прототипическое значение лексемы «head»- «верх, расположенное в верхней части» лежит в основе каждого употребления данного многозначного слова.

Для сопоставления рассмотрим английское широкозначное существительное «**thing**». Словарь дает следующие значения\ употребления существительного «thing»: 1) вещь, предмет, сущность; 2) вещи, багаж; 3) одежда, предметы одежды; 4) принадлежность; 5) утварь; 6) еда, питье; 7) обстоятельство, дела, случай, факт, ситуация; 8) вещь, нечто, что-то, «такая штукавина»; 9) вещество, материал; 10) что-то нужное, подходящее, настоящее; 11) «пунктик», необъяснимое чувство; 12) живое существо, создание; употребляют вместо имени, которое не могут вспомнить или не знают точно; 13) вещь, литературное произведение; любовная история и др. В перечне употреблений лексемы «thing» невозможно выделить некое объединяющее значение. Исследователи относят лексему thing к широкозначным словам (напр., Плоткин В. Я., Никитин М. В., Ирисханова О. К.). И следует отметить, слово «thing» можно использовать применительно к почти любой сущности или событию, но при этом связь между теми сущностями, к которым можно его отнести, отсутствует. Иначе говоря, значение лексемы «thing» полностью зависит от контекста, и его употребление вне контекста делает невозможным его понимание.

По мнению лингвистов, информация, накопленная в семантической памяти, дает возможность употреблять многозначное слово в общепринятых значениях, в общепринятых смыслах (senses). А различие между многозначностью и широкозначностью формулируется таким образом: многозначное слово состоит в родстве с целым рядом общепринятых употреблений, тогда как широкозначному слову недостает общепринятых смысловых отличий (Evans V., Green M. 2006). Что влияет на «появление» или «исчезновение» смысловых отличий?

Может быть, происходит увеличение объема значения слова, и в результате этого увеличивается количество значений? И тогда лексема становится настолько широкозначной, что только контекст помогает понять значение такого употребления? Каков механизм наращивания объема значения?

Исследования З. Я. Кармановой, на наш взгляд, помогут приблизиться к ответу на поставленные вопросы. В своем исследовании З. Я. Карманова проводит аналогию между структурной единицей сознания – нейроном и словом. Процессы формирования внутренней формы слова коррелируют с процессами формирования и функционирования нейронов в сознании человека. «Слово «порождается» и записывается в нейроне. Подобно любому нейрону, нейросема состоит из тела и дендритов (ответвлений). И в процессе речемыслительной деятельности ядро нейросемы обрастает дендритами... А под влиянием различных факторов происходит изменение смысловой матрицы слова-нейрона. Такие изменения связаны с процессами возникновения, расширения, сгущения, угасания дендритовых отростков в сознании» (2010: 315–316). Возможно, это и приводит к увеличению объема значения слова. «Сгущение, угасание ответвлений (т.е. значений слова) нейросемы» приводит к тому, что утрачивается родство с общепринятыми употреблениями. И в итоге возникает широкозначность.

Общеизвестно, что широкозначность существует в ряде европейских языков. Широкозначные слова частотны в употреблении. Например, человек спрашивает приезжего: “Are **things** in this part of the world the same as in yours or not?” (R: Ситуация\жизнь в этой части земного шара такая же, как и на твоей земле, или нет?). В следующем примере мужчина эмоционально описывает, что случилось с радиатором его автомобиля: «When I tried to take the cap off **the thing** where you top up the water, the **blasted thing** had melted and fused to the lid of the container» (R: Когда я попытался снять крышку с той штуковины, куда воду заливают, оказалось, что эта проклятая крышка расплавилась и приклеилась к радиатору). Делексикализация широкозначного существительного thing в вышеприведенных примерах наглядно демонстрирует, как материальная оболочка становится «пустой» и контекстнозависимой.

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ЗАВИСИМОСТЬ ЭФФЕКТИВНОСТИ ИНТУИТИВНОЙ КОГНИТИВНОЙ СТРАТЕГИИ ОТ ПСИХОЛОГИЧЕСКИХ СВОЙСТВ ЛИЧНОСТИ

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РЕЗЮМЕ

Представлены результаты эмпирического исследования, посвященного анализу когнитивных стратегий распознавания свойств неизвестного лица по его фотопортрету и их связей с психологическими свойствами субъекта. Обнаружена корреляция эффективности когнитивной стратегии с соционическим типом субъекта и, тем самым, с особенностями анатомии его мозга.

МЕТОД

Интуитивная когнитивная стратегия является одной из основных при оценке и классификации сложных объектов или образов [1,2]. Зависимость эффективности такой стратегии от базовых психологических свойств личности проверялась в следующем эксперименте. Испытуемые (студенты, 20 мужчин и 60 женщин в возрасте 17–28 лет) в течение 2 месяцев ежедневно тренировались в определении темперамента человека по его фотопортрету. Каждая тренировка заключалась в предъявлении испытуемому 20 фотопортретов неизвестных ему лиц с указанием типа темперамента (4 градации), а затем в предъявлении тестовой последовательности 20 фотопортретов других лиц, для которых он должен был указать тип темперамента. После тестирования испытуемому показывались его результаты и истинные типы темперамента анализируемых лиц. Студентам разъяснялись психологические и физиологические основы учения о темпераменте человека, поведенческие особенности лиц разного типа темперамента, но визуальные признаки проявления темперамента на портрете не обсуждались. Для тренировки использовалась база из 400 фотопортретов лиц от 15 до 70 лет, темперамент которых был определен с помощью стандартного теста (Айзенк) и подтвержден совпавшей оценкой трех опытных экспертов.

Тренировки проходили под руководством опытного наставника-эксперта. Он контролировал ход обучения каждого испытуемого, подбирая индивидуальные наборы тренировочных и тестовых фотопортретов, направленные на освоение особо трудных для тестирования вариантов человеческой внешности, предлагал оптимальный для данного испытуемого способ работы с собственной интуицией [3,4]. В конце двухмесячной тренировки испытуемые проходили итоговое тестирование – определение типа темперамента 40 лиц по их фотопортретам, не входившим в обучающую базу портретов. Результаты итогового теста отражены в таблице 1.

Число ошибок определения типа темперамента	Число испытуемых
0	1
1–5	12
6–10	17
11–15	24
16–25	22
26–35	4

Таблица 1.

Каждый испытуемый заполнял опросники различных типовых психологических тестов, направленных на определение базовых психологических свойств личности (тесты Айзенка, Кеттелла, соционические тесты). Полезависимость-полenezависимость определялась по тесту Г. Виткина «Включенные фигуры» [10]. Время нахождения простой фигуры в сложной характеризует полenezависимость. Показатель ригидности-гибкости когнитивной стратегии оценивался с помощью теста словесно-цветовой зависимости Дж. Струпа [9]. Характеристическим показателем являлось различие во времени выбора слов, написанных шрифтом разного цвета, и карточек разных цветов.

Далее мы искали соответствие между успешностью выполнения задания на определение темперамента и психологическими

№	Наименование характеристики	Коэффициент корреляции
1	Этика (соционический фактор)	0.84
2	Интуиция (соционический фактор)	0.76
3	Тревожность (по Кеттеллу)	-0.47
4	Ригидность когнитивной стратегии (по Струпу)	-0.43
5	Эмоциональная стабильность (по Кеттеллу)	0.31
6	Полнезависимость (по Виткину)	0.31
7	Эмоциональная напряженность (по Кеттеллу)	-.023
8	Иррациональность (соционический фактор)	0.22

Таблица 2.

характеристиками испытуемых. Как известно [5,6], соционическая модель личности выделяет в качестве ведущих характеристик человека, определяющих восприятие и переработку информации, а также принятие решений на основе данной информации, следующие аспекты: этика/логика, интуиция/сенсорика, экстраверсия/интроверсия, рациональность /иррациональность. Среди них именно первые два аспекта оказались ключевыми для успешности реализации интуитивной когнитивной стратегии испытуемых, что не было ранее отмечено в более ранних исследованиях [7,8].

В таблице 2 приведены значимые ($p > 0.05$) коэффициенты корреляции для зависимости точности выполнения теста испытуемыми от их психологических качеств:

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АВТОМАТИЗИРОВАННОЕ ОПРЕДЕЛЕНИЕ ЭМОЦИЙ ЧЕЛОВЕКА ПО ДВИЖЕНИЯМ И ПОЗАМ

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Эмоции играют важнейшую роль в человеческой жизни. По тому, как выражаются и проявляются эмоции, можно многое сказать об отношении человека к различным объектам. Эмоции влияют на когнитивные процессы, и в том числе на процесс принятия решения о совершении каких-либо действий, поэтому системы определения эмоциональных реакций приобретают всё большее значение. Обзор разработок компаний Ugobe, Machine Perception, NeuroSky,

VibraImage, Sound Intelligence, TruMedia, FaceReader, Federal Express, лабораторий ERIC, Affective Computing Research, Массачусетского технологического университета (MIT), института Фраунхофера, университетов Женевы и Токио, Microsoft, Apple, Sony показывает, что на сегодняшний момент не существует системы, полностью реализующей анализ всех средств передачи эмоциональных реакций человека. При этом темпы развития технологий и повышенный интерес зарубежных и российских специалистов показывают, что автоматизация определения эмоциональных реакций – актуальное и востребованное направление исследований.

Работа, ведущаяся на кафедре «Системы автоматизированного проектирования и поискового конструирования» Волгоградского

государственного технического университета, направлена на определение эмоциональных реакций людей по речи и телодвижениям. Рассмотрим обобщенную архитектуру разрабатываемой системы определения эмоциональных реакций. В ее состав входят как уже созданные блоки, так и проектируемые. На вход системы подается видеосигнал, звуковой сигнал и образцы рукописного текста. На выходе оператору системы сообщается об эмоциональном состоянии исследуемых людей.

Основная работа над системой сейчас направлена на создание подсистемы работы с телом человека. Входом в подсистему служит распознанное движение в формате *bvh*, а также данные, необходимые для подготовки к эксплуатации. Эти данные включают в себя информацию о характерных позах и телодвижениях. Требуемая информация собирается от сенсора Microsoft Kinect. Выход – информация о распознанных эмоциональных реакциях.

Для автоматизации процесса распознавания эмоционального состояния человека по движениям и позам разработаны: классификация характерных поз и их соответствие эмоциональным реакциям; база данных, хранящая интерпретацию, словесное описание и изображение характерных поз; нейросетевая модель идентификации позы человека и эмоциональной реакции. Автоматизирован процесс предобработки данных и формализована активность движений человека. Произведена фазификация динамической информации, а также грануляции 1-го и 2-го уровней. Разработана модель представления характерных жестов и телодвижений в виде нечеткого последовательного темпорального высказывания. Построены правила соответствия полученных описаний интерпретациям психологов.

Одна из задач – поиск нечетких границ разбиения событий. Располагая границами событий, формами функций принадлежности для переменных и правилами перехода между ними, можно дефазифицировать значения, чтобы получить анимацию векторной модели человека. Таким образом, если правила построены и описывают паттерны, которые были получены при помощи захвата движений людей, а не сгенерированы в специально предназначенных пакетах, например, Poser, 3ds Max, Motionbuilder или др., то в результате мы получим более правдоподобные эмоциональные характерные жесты персонажей компьютерных игр и приложений. Также, обращая внимание на всевозрастающие объемы рынка индустрии компьютерных игр и приложений, можно говорить об актуальности

обратной задачи – по заданному текстовому описанию построить анимацию векторной модели человека. В этом случае имеем на входе описание на ограниченном естественном языке, на выходе – анимированное движение в виде *bvh* файла.

Еще одна из задач, которая в настоящее время находится в процессе решения, состоит в том, чтобы из трех нечетких последовательных темпоральных высказываний, каждое из которых описывает движения вокруг одной из осей, построить одно высказывание, которое будет интегрально описывать все три, при этом семантика останется неизменной.

На данном этапе совместно с психологами нами были разработаны высказывания на ограниченном естественном языке, которые описывают поведение человека, когда он испытывает недовольство или нетерпение. Таким образом, система, имея набор высказываний, которые получены при помощи данного метода, и их интерпретацию, анализирует движения человека и строит описание на ограниченном естественном языке. Затем методом скользящего окна обнаруживает характерные паттерны и сигнализирует об этом пользователю автоматизированной системы.

Рассмотрим области, где применение системы определения эмоциональных реакций может быть полезно и необходимо. Такими областями являются: контроль общественных мест для противодействия противоправным и экстремистским действиям; контроль поступающих звонков в службы доверия, экстренные службы (выявление излишне эмоциональных звонков); криминалистическая экспертиза – отсев фонограмм, содержащих излишне эмоциональную речь; отслеживание переживаний при снятии денег с банкомата, кассы; контроль состояния водителей; контроль сотрудников аэропортов, атомных станций и других важных объектов для недопущения к работе людей с неустойчивым эмоциональным состоянием; контроль действий сотрудников для предотвращения неврозов, депрессивных состояний; применение в играх, например, в играх, разрабатываемых министерством обороны, для повышения реалистичности происходящих действий; замена полиграфа.

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КОГНИТИВНЫЙ АНАЛИЗ ДАННЫХ С ИСПОЛЬЗОВАНИЕМ ФУНКЦИИ КОНКУРЕНТНОГО СХОДСТВА

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Термин «Когнитивный анализ» подчеркивает необходимость ориентации на человека. Человек рассматривается в качестве объекта изучения его когнитивных механизмов и в качестве субъекта – потребителя результатов анализа данных. Наибольший интерес представляет способность человека делать предсказания будущих фактов по результатам наблюдения прошлых событий.

Изучение человеческих методов анализа данных показывает, что в процессе принятия решений человек использует простейшие решающие правила. Способность человека находить тонкие различия между похожими объектами основана на уникальных возможностях рецепторов и специфичном способе оценки сходств и различий. Эти особенности человеческого восприятия отражает **функция конкурентного сходства**. Если расстояния от контрольного объекта z до эталонов a и b двух образов равны $r(z, a)$ и $r(z, b)$, то величина сходства z с a в конкуренции с b равна $F(z, a|b) = \{r(z, b) - r(z, a)\} / \{r(z, b) - r(z, a)\}$. При совпадении z с a $F=1$, при совпадении z с конкурентом b $F=-1$. Граница между классами проходит по точкам с $F=0$.

FRiS-функция используется в качестве унифицированной основы при построении эффективных методов решения всех задач анализа данных: выбора эталонов при построении решающих правил; получения количественной оценки компактности; автоматической классификации (таксономии); выбора информативных признаков; обнаружения ошибок и заполнения пробелов; прогнозирования.

Приведем примеры решения прикладных задач.

В задаче распознавания двух видов лейкемии (ALL и AML) данные представлены матрицей векторов экспрессии генов, [2]. Обучающая выборка содержит 38 объектов, тестовая выборка – 34 объекта. Исходное количество признаков (генов) $N=7129$.

В работе [2] были найдены наилучшие подсистемы, размерность которых кратна степени числа 2: 4096, 2048, ..., 4, 2 и 1. По двум лучшим признакам, которые можно выбрать по результатам обучения, программой SVM правильно распознано 30 объектов, по 4 лучшим признакам – 31, по 128 признакам – 33. Нами из 7129 признаков было выбрано 18 признаков, из которых программа построила 30 вариантов решающих правил. В состав каждого правила входило от трех до шести признаков. Первые 27 правил дают результат 34 из 34. Сравнение решающих правил SVM и FRiS на одних и тех же признаках показало существенное преимущество FRiS-метода.

В работе [3] 9 задач из области генетики решены с применением 10 методов выбора признаков и 4 типов решающих правил (SVM, BGA, NBC и kNN). Если просуммировать порядковые места, занятые десятью методами на каждой из задач, то получатся величины от 32 до 47. Алгоритм FRiS-GRAD показал лучший результат на семи задачах из девяти и набрал сумму мест, равную 12.

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Я-НАРРАТИВЫ ЖИЗНЕННЫХ ПЕРСПЕКТИВ МОЛОДЫХ ПЕТЕРБУРЖЦЕВ

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Нарративные техники только начинают активно применяться в пространстве отечественной психологической науки. Настоящее исследование направлено на анализ когнитивных механизмов придания смысла и концептуализации истории собственной жизни – автобиографических или Я-нарративов современных молодых петербуржцев – и их связи с особенностями отношения к своим жизненным перспективам.

Нарративная схема является разновидностью когнитивных схем, в рамках которой человек рассматривается как герой определенной истории, произошедшей в прошлом, настоящем или будущем, реальной или воображаемой. Согласно Дж. Брунеру (1986), обобщение личного опыта происходит одним из двух несводимых друг к другу способов: логико-парадигматическим (научным) или нарративным. В первом случае мы оперируем умозаключениями и понятиями, во втором – историями, когнитивными схемами социального познания, располагающими факты в виде организованных «сюжетов» в социальном и временном пространстве. Восприятие фактов человеческой жизни приобретает для человека смысл именно благодаря их обобщению в виде истории или нарратива (Bruner, 1986, Sabrin, 1986, Polkinghorn, 1988, Макадамс, 2008).

Посредством Я-нарративов (self-narratives) люди осмысливают собственное я (self), а также события и факты, имеющие к нему отношение. Структура нарратива отражает (Crossley, 2000) взгляд на события с точки зрения интенционального субъекта. Протагонист (герой), обладающий определенным намерением, сталкивается с затруднением и пытается его преодолеть. Одна из существенных структурных характеристик я-нарративов – начала описываемых событий (Тжебиньский, 1995, 2001). Существует два основных вида начал: затруднения или намерение персонажа. В первом случае рассказываемая история начинается с появления проблемы, которая вызывает реакцию со стороны персонажа, чьи потребности поставлены под угрозу. Действия персонажа мотивируются защитой предшествующего положения дел. Такие истории получили название защитных Я-нарративов. Во втором случае история начинается с намерения персонажа, затем идет стадия планирования и действий. Такой вид нарративов был

назван проактивными я-нарративами. Согласно исследованиям Е. Тжебиньского 1995, особенности начала историй достаточно стабильны и характерны для конкретных людей, а склонность строить я-нарративы определенным образом – например, проактивным или защитным, может обуславливать стиль жизни человека. Конструирующий потенциал нарратива бессознателен, история жизни человека, как и составляющие ее события, воспринимается как объективная реальность, описываемая человеком, однако форма этого описания (нарратив) оказывает влияние на интерпретацию событий жизни человека, а следовательно, на его поведение.

Дискурсивный (в частности, нарративный) анализ неразрывно связан с изучением языковой структуры высказывания. Исследований типов Я-нарративов на русскоязычной выборке до настоящего момента не проводилось. В настоящем исследовании нами выявлялись типичные особенности формулировки Я-нарративов защитного и проактивного типа на материале автобиографических историй о прошлом и будущем. Был сформулирован первичный перечень дискурсивных маркеров, речевых особенностей, позволяющих отнести текст к проактивному / защитному типу Я-нарратива на материале письменной речи – текстов автобиографической истории («Краткая история жизни») – и на материале полуструктурированного интервью («Цели в жизни») для устной речи.

Нами были собраны автобиографические сочинения, отражающие взгляд испытуемых на их жизнь в экзистенциальном масштабе (их прошлое – «основные вехи жизни», настоящее – «несколько слов о себе» и возможное будущее – «планы, перспективы, опасения, надежды на будущее» в масштабе жизненного пути). Было проведено структурированное интервью о жизненных перспективах (возможном будущем я, важнейших жизненных целях, трудностях и планировании целенаправленных изменений в жизни). Данное интервью является частью блока тестовых и качественных методов сбора данных «Развитие идентичности», разработанного в рамках Youth Development Project (Ferrer-Wreder, 2008), переведенного и апробированного нами в пилотажных исследованиях. Отношения к жизненным перспективам также исследовались при помощи методик «Психологическая автобиография» Е. Ю. Коржовой (2002), биографическое интервью Н. В. Логиновой «Формальная биографическая анкета» (Практикум..., 2000),

проективная методика рисуночной метафоры «Жизненный путь» И.Л. Соломина (2002). Ожидалась связь типа Я-нарратива и с личностными особенностями (Леонтьев Д.А. 2000, 2006, Практикум..., 2000, Макадамс, 2008): положительная корреляция проактивного типа с интернальностью локуса контроля, высокой мотивацией достижения, жизнестойкостью, наличием и разработанностью целей в будущем, а также большей длительностью временной перспективы, преобладанием тем достижения над темами общности (использ. коэф. корр. Спирмена, U-критерия Манна-Уитни).

В проекте в качестве испытуемых на первом этапе исследования принимали участие 96 человек в возрасте от 12 до 35 лет, средний возраст 19,3, в основном студенты 2–3 курсов и учащиеся выпускных классов.

В текстах автобиографических историй были выявлены четыре типичных я-нарратива: (1) проактивный (дискурсивные маркеры: личные местоимения в сочетании с глаголами в активном залоге; глаголы, отражающие интенции и отношения (напр. желать, выбирать, любить); описание поведения других людей с учетом theory of mind (указание на внутренние причины поведения субъектов); начала сюжетов – интенция субъекта); (2) защитный (дискурсивные маркеры: опускание личных местоимений; реверсивная форма: глагол, затем местоимение («родился я»), интерпретируемое нами как форма разотождествления я-рассказчика с я-героем; глаголы в пассивном залоге; безличные предложения, предложения с обобщенным субъектом («все»), описание поведения других людей как факта или как причины собственного поведения (без указания на интенции поведения субъектов); начала сюжетов – отражение проблемы); (3) смешанный (проактивный и защитный в различных сферах, описываемых периодах жизни) и (4) неопределенный (отсутствие ярких паттернов изложения) типы.

В отношении жизненных перспектив и личностных особенностей обнаружено: для людей с проактивным Я-нарративом характерно описание большего количества событий будущего и их большая детализация; большая структурированность изложения и более последовательный и частый переход от «ландшафта действия» к «ландшафту сознания» (White, 2007) в структуре повествования; интернальный локус контроля-Я, высокий общий уровень осмысленности жизни; осознание наличия целей в жизни, удовлетворенность ее результатами, несколько более высокая жизнестойкость. Для людей с защитным Я-нарративом характерна

большая эмоциональность в описании событий будущего; тенденция к более частому изображению жизненного пути в виде череды статичных, не связанных друг с другом фаз; общий интернальный локус контроля – жизнь, преобладание мотивационной тенденции избегания неудач. Для людей со смешанным типом Я-нарратива более характерно описание тем «достижения» через проактивный Я-нарратив, а тем «общности» – через защитный Я-нарратив. Для людей с «неопределенным» типом Я-нарратива характерна наибольшая неопределенность в описании событий будущего, наименьшая разработанность, наименьшее количество событий будущего, самая маленькая временная перспектива будущего.

Дальнейшее изучение нарративной идентичности субъекта жизненного пути открывает перспективы в области современной когнитивной психологии индивидуальности.

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ОБУСЛОВЛЕННОСТЬ СОСТОЯНИЯ КОГНИТИВНЫХ ФУНКЦИЙ ГОРОДСКИХ ДЕТЕЙ И ПОДРОСТКОВ ЭЛЕМЕНТНЫМ ДИСБАЛАНСОМ

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В последние 10 лет накопилось большое количество научных работ, выполненных на клеточном уровне, широкомасштабные мониторинговые исследования, проведенные в разных странах мира (S. Araki, K. Murata, P. Grandjean, S. Caroli, D. Sursel, Кудрин А.В., Громова О.А., Скальный А.В., Скальная М.Г., Транковская Л.В., Евстафьева Е.В., Фролова Т.В., Гжегоцкий М.Р.), которые раскрывают роль элементного дисбаланса в развитии патологических состояний организма взрослых и детей. Установлено, что содержание ряда биоэлементов в тканях (волосы, ногти, кровь, слюна, моча) претерпевает определенные изменения, характерные для ряда нозологий, в том числе для состояния психической сферы развивающегося организма [1].

Действие комплекса антропогенных факторов, к которым относят тяжелые металлы, за последнее время привело к значительному ухудшению состояния здоровья детского населения не только Украины, но и всех стран СНГ. В условиях антропогенного прессинга растет количество детей, у которых регистрируют различного рода расстройства нервной системы [2,3,4]. Изменения психической сферы могут быть обусловлены не только колебанием концентраций химических элементов в окружающей среде, но и, как следствие, нарушением элементного баланса в организме.

В связи с этим оценка элементного статуса у наиболее ранней категории городского населения – детей и подростков, более всего подверженных неблагоприятному влиянию загрязнителей окружающей среды современных урбанизированных территорий, и поиск биомаркеров раннего донозологического определения состояния здоровья, в том числе состояния высших психических функций является актуальной задачей.

У 60-ти детей и подростков $13,4 \pm 1,26$ лет,

жителей промышленных юго-восточных районов Украины (1-я группа), рентгено-флуоресцентным методом определили содержание (Ca, Mn, Fe, Mo, Ni, Sr, Pb) в волосах. Состояние кратковременной памяти и произвольного внимания оценивали с помощью тестов «запоминание 10 слов», таблиц Шульте, корректурной пробы. В качестве условно-контрольной группы были взяты 60 подростков $12,9 \pm 0,07$ лет, жителей г. Симферополя (2-я группа). Данные биомониторингового и психологического обследования тестируемых обрабатывали посредством непараметрического корреляционного анализа по Спирмену.

У детей 1-й группы обнаружен избыток Ca, Ni и Mo, значение медианы для Pb приближалось к верхней границе нормы ($4,9$ мкг/г), что можно расценивать как преобладание среди обследуемых детей с избытком Pb в организме. Из всей группы Mn обнаружили только у 4-х испытуемых. У подростков 2-й группы был установлен дефицит основных элементов (Ca, Fe, Mn) без существенных отклонений токсичных элементов.

У испытуемых 1-й группы выявлены корреляционные связи временного показателя поиска цифр (T1-T5) в отдельных таблицах Шульте с эндогенной концентрацией Fe, Mo, Ni. Прямой характер связи может указывать на то, что дети с более высокими эндогенными концентрациями этих элементов тратят больше времени на поиск цифр в отдельных таблицах Шульте (рис.1, часть 1).

У детей 2-й группы количество корреляций было больше (9), разностороннего характера и установлено с большим диапазоном характеристик произвольного внимания. Например,

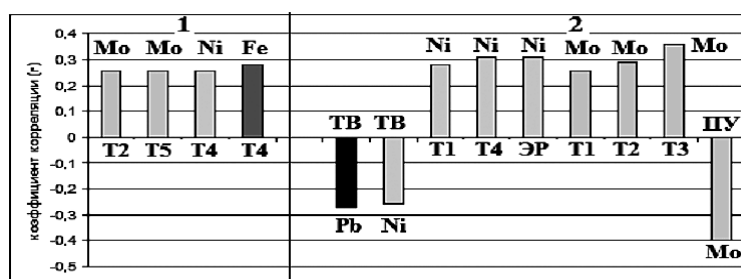


Рис. 1. Величины коэффициентов корреляции показателей произвольного внимания с содержанием химических элементов в волосах детей из промышленных регионов Украины (1) и детей крымского региона (2). ТВ – точность внимания, ЭР – эффективность работы, ПУ – психическая устойчивость.

условно-токсичный Ni обнаружил разносторонние связи с точностью внимания и эффективностью работы.

На способность воспроизводить слова детьми 1-й группы после двукратного предъявления в тесте «10 слов» оказывал влияние только Ni ($r=0,29$, $p=0,02$). Эндогенное содержание Pb было значимо для способности воспроизвести слова через час после тестирования ($r=-0,33$, $p=0,009$). Характер связи может свидетельствовать о негативном характере мнестических процессов у детей с более высокими концентрациями Pb и согласуется с известным неблагоприятным влиянием Pb на качество памяти [5].

В целом, у обследованных 1-й когорты не обнаружили нейротропной значимости Ca, Mn, Sr для показателей произвольного внимания, кратковременной памяти. В то же время у детей 2-й когорты были установлены более многочисленные достоверные связи для всех 7 химических элементов (19 корреляций). При этом плотность корреляционных связей колебалась от умеренной до средней $0,26 < r < 0,45$, но была при этом статистически достоверной ($0,05 < p < 0,001$).

Таким образом, при наличии элементного дисбаланса обнаруживается умеренное, но

значимое влияние Ca, Mn, Fe, Mo, Ni, Sr, Pb на состояние произвольного внимания и кратковременной памяти детей 2-х групп, которое проявляет себя прежде всего в случае неоптимального содержания эссенциальных элементов.

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КОГНИТИВНЫЕ ОСНОВЫ МОДЕЛИРОВАНИЯ ТЕРМИНОЛОГИИ

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В современных лингвистических исследованиях особый интерес вызывают активно развивающиеся терминологии, которые постоянно поставляют обширный материал для терминологического исследования и поэтому нуждаются в упорядочении и стандартизации. Сегодня в мире в условиях глобализации и интеграции основное внимание уделяется новым современным методикам изучения иностранных языков. Появление компетентностного подхода в методике преподавания иностранных языков сопровождается динамическими процессами в терминологии, появляются новые термины, изменяется значение традиционных методических терминов.

Современная лингвистика предполагает изучение языка во взаимосвязи с человеком, его сознанием, мышлением и деятельностью. Поскольку сама речевая деятельность, как

правило, включена в какую-либо специальную деятельность, а языковой знак развивается в определенной профессиональной сфере, постольку приоритет в исследовании терминов принадлежит когнитивно-дискурсивной лингвистике.

Изучение терминологии с позиций когнитивно-дискурсивного подхода позволяет преодолеть фрагментарность традиционного рассмотрения термина, применить интегративный подход к его изучению на основе моделирования. В рамках данного подхода рассматриваются различные способы вербальной репрезентации знания, т.е. концепта. Концепт как обобщенное знание формируется в дискурсе – «сложном коммуникативном явлении, включающем кроме текста еще и экстралингвистические факторы (знания о мире, мнения, установки, цели адресата), необходимые для построения текста» (ван Дейк 1994: 125). Термин при таком подходе предстает как один из способов вербальной репрезентации специального знания, или «информационно-когнитивная структура, аккумулирующая специальные знания, необходимые в процессе научной

коммуникации и профессионально-научной деятельности» (Комарова 2010).

Для изучения терминологии методики преподавания иностранных языков была разработана комплексная методика моделирования, которая включает, во-первых, моделирование специального знания в виде онтологии, под которой понимается «модель предметной области» (Карась 2010), во-вторых, моделирование терминологии в виде терминологического поля, которое представляет собой «унифицированную по системному основанию многоуровневую классификационную структуру, объединяющую термины сферы однородной профессиональной деятельности» (Морозова 2004: 275), в-третьих, моделирование тезауруса, который представляет собой «модель языка науки, а не только его словаря, и более того – модель структуры соответствующей области знания» (Никитина 1987).

На первом этапе нами как экспертами в данной области были выделены основные понятия методики преподавания иностранных языков (узлы онтологии), составляющие концепт *компетенция*.

На втором этапе исследования был выделен корпус контекстов, описывающих основные понятия компетентностного подхода, установленных при онтологическом моделировании.

В проведенном исследовании онтологическое моделирование было дополнено семантико-фреймовым анализом, на основании которого была составлена модель концепта «компетенция», представляющая собой сценарный фрейм. Слоты фрейма соответствуют узлам онтологии. Каждый слот фрейма задан определенным падежом парадигмы семантических падежей Филлмора. Падежи Филлмора задают также отношения между слотами фрейма.

На четвертом этапе исследования из контекстов были выделены термины. Вся совокупность терминов была представлена в виде терминологического поля, объединяющего термины сферы однородной профессиональной деятельности. Структуру терминологического поля *компетенция* представили следующим образом: макрополе – субполе – микрополе.

Напомним, что контексты характеризуют то или иное понятие компетентностного подхода. Поэтому первоначально все термины, выделенные из контекстов одной группы, были объединены в одно макрополе.

На следующем этапе происходит дальнейшее деление каждого макрополя на субполя. При рассмотрении особое внимание уделялось дефиниции ключевых терминов. Далее при рассмотрении семантических отношений между

составляющими каждого субполя происходило деление субполей на микрополя.

На шестом этапе между терминами каждого микрополя устанавливались семантические отношения (родовидовые, партитивные, отношения синонимии и антонимии).

Седьмой этап включал тезаурусное моделирование. Применение метода тезаурусного моделирования помогло расположить термины в каждом микрополе как на вертикальной оси, установив родовидовые и партитивные отношения, так и на горизонтальной оси, установив между терминами отношения синонимии и антонимии. Установление семантических отношений помогло составить тезаурусные модели. В каждой тезаурусной модели выделялся вышестоящий термин, а также нижестоящие термины. В нашем исследовании было обнаружено 10 видов тезаурусных моделей.

Проведенное исследование позволило сделать выводы, что одним из способов вербальной репрезентации концепта «компетенция» в рамках когнитивно-дискурсивного терминоведения может быть рассмотрена терминология компетентностного подхода, к исследованию которой применяется комплексная методика, включающая моделирование терминологического поля, онтологическое и тезаурусное моделирование. Применение онтологического моделирования и семантико-фреймового анализа концепта «компетенция» позволяет систематизировать специальное знание и составить наиболее полное представление о нем. Онтологическая модель, отражающая основные понятия предметной области, комплементарно дополняется сценарным фреймом, отражающим концептуализацию и взаимосвязи понятий. Структурированные в виде онтологии понятия задают полевую модель терминологии компетентностного подхода. Семантический анализ упорядоченных в виде терминологического поля терминов позволяет установить семантические отношения синонимии, антонимии, гиперонимии и партитивности, на основании которых проводится тезаурусное моделирование.

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ПОИСК МЕХАНИЗМОВ РЕГЕНЕРАЦИИ ПАМЯТИ: ЭКСПРЕССИЯ *c-fos* ПРИ ВОССТАНОВЛЕНИИ ПАМЯТИ, НАРУШЕННОЙ БЛОКАДОЙ СИНТЕЗА БЕЛКА

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Память является одной из основных функций мозга, которая обеспечивает формирование индивидуального опыта животного и его адаптивное поведение в условиях изменяющейся окружающей среды. Такие изменения поведения требуют изменений в работе различных областей мозга, в активности клеточных ансамблей и отдельных нейронов. Лежащие в основе этого молекулярно-биологические процессы составляют одну из ключевых и интереснейших проблем нейробиологии.

Известно, что в первые минуты и часы после обучения память переходит из кратковременной, лабильной формы в долговременную стабильную. Многие клеточные и молекулярные процессы, сопровождающие консолидацию памяти, описаны в литературе (McGaugh 2000; Kandel 2001) и послужили основой для создания схемы каскада событий, приводящих к формированию долговременной памяти. В работах на животных было показано, что нарушение синтеза белка незадолго до или сразу после ситуации обучения приводит к нарушению долговременной памяти и развитию амнезии, которую в большинстве случаев считали необратимой (Gibbs, 1991; Davis and Squire 1984). Однако экспериментально показано, что память, нарушенная во время консолидации, тем не менее, может быть восстановлена (Radyushkin and Anokhin 1999; Sara and Hars 2006).

В основе нашего исследования лежит гипотеза, что мозг с нарушенной памятью продолжает сохранять фрагменты диссоциированных функциональных систем, лежащих в основе воспоминаний. Эти компоненты могут быть вновь интегрированы в целостную систему и проявиться в поведении, если инициировать этот процесс определенными стимулирующими воздействиями. В момент такой инициации (при «напоминании») по активации мозга животного с утраченной памятью можно выявить признаки сохранения у него следов дезинтегрированного опыта. Картировать места такой активации можно по экспрессии «ранних генов», которая

происходит в нейронах головного мозга в различных ситуациях, связанных с новизной, обучением и извлечением приобретенного опыта, требующих пластических перестроек в нейронах (Davis and Squire, 1984; Flavell and Greenberg, 2008).

В настоящей работе исследована экспрессия белкового продукта «раннего» гена *c-fos* в мозге мышей различных экспериментальных групп в модели нарушения и последующего восстановления памяти в задаче условно-рефлекторного замиранья. В данной модели обучения ассоциативный навык приобретает животными в течение одного сеанса, а формирующаяся при этом память является долговременной (Fanselow, 1980). Для моделирования амнезии в эксперименте мышам за 20 минут до начала обучения вводили ингибитор синтеза белка циклогексимид в дозе 100 мг/кг, а животные контрольных групп получали инъекцию физиологического раствора.

Процедуру напоминания проводили через 24 часа после обучения. Напоминание заключается в воспроизведении одного из компонентов процедуры обучения. В наших экспериментах было применено кратковременное (в течение 2 секунд) электрокожное раздражение током 0,5 мА в новой обстановке, после чего животное возвращали в домашнюю клетку. Процедуре напоминания были подвергнуты часть животных из групп, получивших инъекцию раствора циклогексимид и групп, получивших инъекцию физиологического раствора.

Показателем обучения животных в задаче условно-рефлекторного замиранья служит длительность замиранья, которое определяется как отсутствие у животного любых движений, кроме дыхательных, в тесте на условный сигнал (Fanselow, 1980). Тестирование условным звуковым сигналом животных всех экспериментальных групп проводили в новой обстановке, через 48 ч после обучения.

Результаты тестирования показали возможность восстановления памяти у амнестичных животных применением процедуры напоминания. Кроме того, была исследована динамика восстановления памяти при напоминающем воздействии. Установлено, что поведенческая манифестация восстановленной памяти наблюдается не ранее чем через 6 часов после напоминания.

Количественный анализ транскрипционной активности мозга животных при реактивации нормальной и нарушенной памяти показал, что реконсолидация памяти при повторном обращении к ней приводит к выраженной активации мозга. При этом распределение активности и ее интенсивность в отдельных областях мозга различны у животных с нормальной и нарушенной памятью. Так, в поле СА1 и зубчатой фассии гиппокампа мышей обнаружено достоверно большее количество с-Fos-позитивных нейронов в группе восстановления памяти по сравнению с другими экспериментальными группами. В поле СА3 гиппокампа и в прелимбической коре мышей максимальная индукция с-Fos обнаружена при реактивации нормальной памяти; в базолатеральном ядре миндалины и цингулярной коре высокий уровень экспрессии наблюдался у групп, получавших напоминание, независимо от их предварительного опыта. Возможную индукцию с-Fos самим электрокожным раздражением в данном случае можно исключить, так как не было выявлено достоверных отличий между пассивным контролем и группами, получившими напоминание. Эти данные позволяют заключить, что повышение экспрессии транскрипционного фактора с-Fos в поле СА1 и зубчатой фассии гиппокампа связано с процессом восстановления памяти, который был запущен процедурой напоминания.

Таким образом, нами показано, что процесс репарации памяти протекает в течение нескольких часов после восстанавливающего воздействия. Экспрессия транскрипционных факторов при репарирующем воздействии выявляет специфические области мозга, которые, по-видимому, сохраняют фрагменты систем поврежденной памяти и обеспечивают ее восстановление в ходе реинтеграционного процесса.

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ВОСПРИЯТИЕ ВИЗУАЛЬНЫХ СРЕД РАЗНОЙ КОМФОРТНОСТИ И РЕАКТИВНОСТЬ ВЕГЕТАТИВНОЙ НЕРВНОЙ СИСТЕМЫ ЧЕЛОВЕКА

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На современном этапе развития психофизиологии наибольший интерес у исследователей вызывает изучение когнитивных функций через параметры функционирования наиболее реактивных систем организма. Общеизвестно, что вегетативная нервная система (ВНС) достаточно пластична и быстро реагирует на первое предъявление любого значимого сенсорного стимула (Горбунов, Нечаев, 1990). В последние десятилетия возрос интерес к влиянию зрительных сенсорных воздействий разной комфортности на организм человека, поскольку окружающая среда города не всегда является комфортной с точки зрения визуального восприятия. По

мнению Филина (2006), городская среда оказывает на человека стрессорное воздействие.

Изменения деятельности ВНС в ответ на любой стимул можно зафиксировать по величине электрической активности кожи и потовых желёз (Дементенко с соавт., 2010; Dawson et al, 1990). Обследованы 100 студентов, средний возраст которых составил 19,6 лет. Регистрировали вызванный кожный вегетативный потенциал (ВКВП) с помощью ВНС-спектра («Нейрософт»). Обследуемым в течение 20-секундного промежутка времени с монитора компьютера поочередно предъявляли 4 визуальных стимула (изображения) разной степени комфортности: изображение № 1 – «яркоэмоциональный» (вызывающий отрицательные эмоции), № 2 – агрессивный, № 3 – гомотенный и № 4 – комфортный. Изображения подбирались в соответствии с классификацией В. А. Филина (2006). На каждом этапе

Показатели	Пробы				
	№ 1	№ 2	№ 3	№ 4	норма
ЛП, сек	1,91±0,04*	2,22±0,05*	2,18±0,04*	2,26±0,06*	1,76±0,06
A1, мВ	0,81±0,08*	0,40±0,06	0,51±0,07	0,41±0,06	0,47±0,09
S1, сек.	0,93±0,07*	1,13±0,08*	1,32±0,09*	0,98±0,07*	0,67±0,09
A2, мВ	2,03±0,37*	1,18±0,20*	0,87±0,11*	0,89±0,13*	3,16±0,35
S2, сек.	2,39±0,13*	2,09±0,11*	2,02±0,09*	1,82±0,07*	1,41±0,15

Таблица 1. Значения показателей ВКВП у испытуемых при предъявлении визуальных стимулов разной комфортности

*Отличия достоверны по сравнению с нормой при $p \leq 0,05$

исследования у студентов записывали кривую ВКВП. Оценивали следующие параметры кривой: латентный период ВКВП (ЛП), амплитуду первой фазы (A_1), длительность первой фазы (S_1), амплитуду второй фазы (A_2), длительность второй фазы (S_2) (Дементенко с соавт., 2000; Миргородский с соавт., 2010). Полученные кривые ВКВП обрабатывались с помощью программ ВНС–Спектр Copyright. Математический и статистический анализ изучаемых параметров ВКВП проводился с применением набора компьютерных программ SPSS 11.5 для Windows. В статистическую обработку результатов входил анализ распределения признаков и их числовых характеристик (средних величин, ошибки средней, стандартных отклонений) (Наследов, 2007). Усредненные данные сравнивали с нормальными значениями показателей ВКВП здоровых людей в состоянии покоя (табл. 1). Оценка достоверности различий проводилась с использованием параметрического t-критерия Стьюдента. При анализе изучаемых показателей у представителей разного пола достоверных отличий не обнаружено.

В результате проведенных исследований выявлена определенная зависимость показателей вегетативного статуса обследованных при воздействии визуальных сред разной комфортности (табл. 1).

Все полученные значения латентного периода были выше нормы, что свидетельствует о высокой пластичности данного показателя. Однако следует отметить, что величина ЛП при восприятии «яркоэмоционального» изображения наиболее короткая, что связано с меньшей синаптической задержкой ответной реакции на уровне головного мозга и характеризует более высокую реактивность симпатической нервной системы.

Анализируя показатель амплитуды первой фазы, следует отметить его увеличение при восприятии изображения, вызывающего отрицательные эмоции и изображения с гомогенной визуальной средой. Наблюдаемое изменение,

по-видимому, связано с активацией эрготропной системы мозга, обеспечивающей мобилизацию и расходование энергетических ресурсов организма при его активной деятельности. Симпатикотония в данном случае обоснована стрессовой реакцией организма в ответ на предъявленные изображения.

Изменения, зафиксированные в отношении других показателей ВКВП, свидетельствуют об увеличении тонуса парасимпатической нервной системы и повышении активности трофотропных надсегментарных центров, что особенно выражено для показателей второй фазы ВКВП. Данные изменения являются ожидаемыми, поскольку вторая фаза кожного вегетативного потенциала связана с активацией восстановительных процессов, на которые требуется больше времени после восприятия в разной степени некомфортных изображений.

Таким образом, влияние визуальных сред разной комфортности приводит к специфическим изменениям изученных показателей вегетативного статуса организма человека. Параметры латентного периода (ЛП), амплитуды первой и второй фазы (A_1 , A_2) и длительность второй фазы (S_2) ВКВП являются своеобразными маркерами комфортности визуальной среды. *Работа поддержана АБЦП «Развитие научного потенциала высшей школы».*

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ВОСКЛИЦАТЕЛЬНЫЕ КОНСТРУКЦИИ: ОТ ПРАГМАТИКИ К СИНТАКСИСУ

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Данный доклад посвящён восклицательным конструкциям (далее ВК), засвидетельствованным в разных языках мира. Под ВК (вслед за Portner and Zanuttini 2003) подразумеваются синтаксические конструкции, конвенционально ассоциирующиеся с иллюкутивной силой экспрессива: *Какой вкусный суп ты приготовил!* (ср. с утвердительным предложением, также выражающим экспрессию: *Ты приготовил потрясающий суп!*). В докладе выделяются универсальные синтаксические и прагматические признаки ВК и утверждается связь между этими признаками.

Во-первых, в докладе предлагается следующий тезис о синтаксических разновидностях ВК, выдвинутый на основе анализа 50 языков, обсуждаемых в литературе и/или исследованных автором доклада: ВК синтаксически могут выражаться либо определённой именной группой (см. (1)), либо группой предложения. Во втором случае ВК подразделяются на ВК с вопросительными словами (далее wh-ВК, см. (2)) и ВК, вводимые подчинительным союзом (далее complementizer-ВК, см. (3)):

- (1) *The things that she reads!* (английский)
'Что она читает!'
- (2) *Ki jott el ebbe a faluba!* (венгерский, Liptak 2006)
кто пришёл-3Ед.ч. Всп.гл. этот.внутри Опр.Арт. деревня.внутри
'Кто пришёл в нашу деревню!'
- (3) *Kam huwa kariim-un!* (арабский, Alseghayar 1998)
Подч.союз он щедрый-Им.п.
'Какой он щедрый!'

Языки различаются тем, могут ли ВК быть синтаксическими актантами фактивных предикатов. Так, в английском пример (4) грамматичен, а в арабском нет:

- (4) *It's astonishing how tall he is!*
'Удивительно, какой он высокий!'

С одной стороны, синтаксис wh-ВК и complementizer-ВК во многих языках идентичен синтаксису подчинительных предложений,

вводимых вопросительным словом или союзом, и, следовательно, эти конструкции в таких языках допускают зависимое употребление. С другой стороны, синтаксически зависимая часть предложения не может иметь иллюкутивной силы, которая приписывается высказыванию целиком, и возникает вопрос, насколько правомочно считать такие конструкции ВК. В докладе доказывается, что одним из факторов служит соотносённость ВК с моментом речи. Так, форма первого лица настоящего времени фактивного предиката допускает восклицательное употребление, а форма прошедшего времени и/или форма не первого лица не допускают. Другой фактор заключается в том, что ВК прототипически являются сентенциальными актантами перцептивных предикатов (например, *смотреть*) и эмотивных (например, *удивляться*), но не предикатов мыслительной деятельности (например, *знать*), см. подробнее в Зевахина 2011.

Второй важный вопрос заключается в том, почему канонические ВК представляют собой градуированные конструкции. Так, в каталанском ВК формируются только с помощью *com* «как» + наречие и *quin* «какой» + прилагательное, но не вопросительных слов со значениями «что», «кто», «где», «когда», «почему». Причём такие наречия и прилагательные должны обозначать градуированные признаки: например, прилагательное со значением «высокий» грамматично в ВК такого рода, поскольку обозначает одно из возможных градуированных значений признака роста/высоты (можно сказать *очень высокий*, *выше* и т.д.), в то время как прилагательное со значением «деревянный» неграмматично. Какое объяснение можно предложить этому языковому факту?

В докладе будет показано, что оба, как утверждается здесь, универсальных синтаксических признака можно объяснить с помощью прагматических механизмов.

Синтаксическая зависимость ВК объясняется тем, что Говорящий считает их пресуппозиционными, т.е. предполагает, что они известны Слушающему. Согласно Elliott 1974 и Grimshaw 1979, сентенциальные

актанты фактивных предикатов являются пресуппозиционными. Таким образом, можно наблюдать прагматико-синтаксическое соответствие между пресуппозициональностью и синтаксической зависимостью, что объясняет, почему возможно синтаксически зависимое употребление wh-ВК и complementizer-ВК. Определённые именные группы также являются пресуппозиционными, что было показано в Strawson 1950.

Что касается второго вопроса, можно со смелостью сказать, что шкала градации того или иного признака позволяет выбрать максимальное значение (что невозможно, если признак не градуирован). Таким образом, Говорящий, находясь в эмоциональном состоянии, может выразить свои эмоции, выбрав максимальную степень и имплицитно сравнив её с контекстуально заданным стандартом. Однако, вопреки Rett 2008, в докладе будет показано, что удивление Говорящего по отношению к неожиданному для него положению дел не обязательно. Например, ВК *Как я тебя люблю!* не обязательно предполагает, что Говорящий удивлён своим чувствам и/или они являются неожиданными для него (скорее, такая ситуация является маркированной). Наконец, этот же пример служит контраргументом другому тезису, высказанному в той же работе и состоящему в том, что ВК грамматичны, т.к. они выражают объективную оценку. В приведённом выше примере выражена субъективная оценка Говорящего.

Наконец, в докладе будет затронута проблема соотношения ВК и грамматической категории

адмиративности, кодирующей внезапное осознание Говорящим какого-либо факта. Сходство состоит в том, что и ВК, и категория адмиративности выражают удивление Говорящего по отношению к неожиданному для него положению дел, и если в языке есть категория адмиративности, то язык может не иметь специальных ВК (например, ряд алтайских языков: казахский, корейский, узбекский). Различие же заключается в том, что, во-первых, ВК обязательно пресуппозициональны, в то время как адмиративные предложения не пресуппозициональны, что можно доказать с помощью прагматических тестов на пресуппозицию, а во-вторых, ВК, как было упомянуто выше, не обязательно маркируют удивление Говорящего по отношению к описываемой ситуации, которая не обязательно нарушает ожидания Говорящего.

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ИЗУЧЕНИЕ РОЛИ СИНТЕЗА ДНК В ФОРМИРОВАНИИ ДОЛГОВРЕМЕННОЙ ПАМЯТИ У МЫШЕЙ

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Память – это нейрокогнитивный процесс, который заключается в формировании, хранении и воспроизведении информации о жизненном опыте индивида. Именно благодаря памяти полученный опыт может накапливаться и становиться источником адаптивных изменений поведения. Согласно классическим представлениям, после эпизода обучения происходит консолидация памяти, т.е. её переход из лабильной, кратковременной формы в стабильную,

долговременную форму. Этап консолидации сопровождается синтезом новых белков и может приводить к структурным изменениям в синаптических контактах нейронов. Однако биохимические и молекулярные механизмы длительного поддержания долговременной памяти в настоящее время изучены не до конца. В частности, остается неясным, каким образом в нейронах в течение длительного времени сохраняется информация о структурных изменениях, произошедших при обучении, при том что это время может во много раз превышать время жизни отдельных белковых молекул. Ряд экспериментальных данных свидетельствует о том, что механизмы длительного хранения памяти могут вовлекать синтез ДНК в мозге. Известно,

что галогенизированные нуклеозидные аналоги могут служить ингибиторами синтеза ДНК. Целью данной работы было проверить, могут ли нуклеозидные аналоги оказывать влияние на формирование долговременной памяти в различных поведенческих моделях.

Лабораторных мышей обучали в трех стандартных задачах: условно-рефлекторное замещение (УРЗ), пассивное избегание (ПИ) и пространственная версия лабиринта Морриса (ЛМ). За 30 минут до обучения мышам внутривенно вводили нуклеозидные аналоги: 5-бромо-2'-дезоксифуридин (BrdU, 100 мг/кг), 5-йодо-2'-дезоксифуридин (IdU, 30 мг/кг), которые встраиваются в синтезирующуюся ДНК и могут в дальнейшем нарушать её функции. Долговременную память тестировали через 3 дня после обучения. В ряде дополнительных экспериментов проводили сравнение действия ингибиторов синтеза ДНК с ингибитором синтеза белка, циклогексимидом (СХМ, 100мг/кг), амнестическое действие которого хорошо изучено. Лабораторных мышей обучали в двух версиях модели УРЗ: в «стандартной» (1 удар тока, 1мА) и «сильной» (3 удара током, 1мА), за 30 минут до обучения вводили BrdU, IdU, или

СХМ. Тестирование долговременной памяти после обучения в «сильной» версии проводили через 3 дня, а при обучении в «стандартной» версии – через 6 часов, 24 часа, 3 дня, 45 дней.

Введение нуклеозидных аналогов перед обучением вызывало нарушение как обстановочной памяти в моделях УРЗ и ПИ, так и пространственной памяти в модели ЛМ. При этом амнестические эффекты нуклеозидных аналогов наблюдали при тестировании через три дня и через 45 дней, но не на более ранних сроках. Введение нуклеозидных аналогов при обучении в «сильной» версии УРЗ вызывало нарушение долговременной памяти, как и в «стандартной» версии, в то же время введение циклогексимида оказывало амнестический эффект только на обучение в «стандартной» версии, но не в «сильной».

Полученные данные свидетельствуют в пользу того, что при формировании долговременной памяти необходим не только синтез белка, но в ряде случаев и синтез ДНК. Было выявлено, что характер амнестических эффектов и динамика их развития различны при введении ингибиторов синтеза белка и ингибиторов синтеза ДНК.

ФУНКЦИОНАЛЬНАЯ ПРЕДСТАВЛЕННОСТЬ ПРОФЕССИОНАЛЬНОЙ МЕТАФОРЫ В ЛИНГВОСЕМИОТИЧЕСКОМ ПРОСТРАНСТВЕ СПЕЦИАЛЬНОГО ЯЗЫКА

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В современной теории языка естественным результатом развития изучения метафоры становится расширение сферы привлечения процедур и методов семиотического подхода. Они начинают включаться не только в анализ метафоры как атрибута художественной речи, но и активно применяются для изучения феномена метафоры в языке научного и собственно профессионального знания.

Предлагаемый нами лингвосемиотический подход изучения метафоры касается описания существования этого феномена как продукта естественного и искусственного семиозиса. С одной стороны, как нам представляется, исследуемый феномен является частью языкового пространства, объективируя особенности идентификации и функционирования любой языковой единицы в речевой интеракции. С другой – частью семиотического континуума,

осуществляющей взаимодействие ментального пространства и речевой деятельности индивида в процессе коммуникации.

Рассматривая профессиональную метафору как ментальную сущность, мы предположили, что она является, прежде всего, когнитивным ориентиром в профессиональном семиотическом континууме, универсальность восприятия которой основывается на её предметности и эвристическом потенциале. Внешняя форма (структурное соответствие) профессиональной метафоры одинакова для различных лингвокультур, в то же время она довольно стереотипна для каждой культуры в отдельности, что проявляется в особенностях идентифицирующей референции. При этом, являясь вербальной репрезентацией прагматически переработанного индивидуального и коллективного знания в профессиональном семиотическом континууме, и благодаря процессам метафоризации профессионального семиотического пространства, профессиональная метафора становится условным субституту профессиональных понятий,

за языковыми значениями которых скрывается общественная практика, преобразованная и кристаллизованная в них деятельность. Эти предположения составили общую концепцию нашего исследования.

Для верификации наших предположений нами была проведена серия экспериментов с использованием методики субъективных дефиниций. Однако, применяя методы психолингвистического исследования, мы констатировали некоторую узость регистративного описания профессиональной метафоры. Согласно предлагаемой нами концепции, профессиональная метафора является единицей, которая имеет одновременно и смысл и референцию: смысл – потому, что несет смысловую информацию (значение), а референцию – потому, что соотносится с определенной ситуацией. В этом контексте нам представляется особенно значимой дифференциация проявлений профессиональной метафоры в устном и письменном коммуникативном пространстве, объективирующая связь «живого» языка с конкретной профессиональной областью. Таким образом, семиотический потенциал профессиональной метафоры потребовал привлечения иных эмпирических методов изучения. В связи с чем нами была разработана номотетическая методика и проведен естественный эксперимент в двух частных клиниках Бостона и Нью-Йорка, в двух частных клиниках Парижа и Лиона и в двух стационарных лечебных учреждениях Курска. В нашу экспериментальную группу вошли испытуемые в возрасте от 34 до 56 лет, в количестве 185 человек для 1-й части эксперимента и 240 человек – для 2-й. Общее количество полученных субъективных дефиниций – 7585; общее количество расшифрованных во второй части экспериментального исследования текстов составило 470 единиц, полученных скриптов – 470, зарегистрированных профессиональных метафор – 276 единиц и 227 субъективных дефиниций.

В ходе психолингвистического эксперимента была произведена проверка гипотезы исследования в части восприятия и понимания профессиональной метафоры специалистами и неспециалистами, выделения национально-культурных особенностей репрезентации «живого» знания посредством исследуемого феномена, уточнение универсальности её внешней формы (структурного соответствия) для различных лингвокультур, и манифестацию стереотипных характеристик для каждой культуры в отдельности.

По результатам первой части эмпирического исследования были сделаны следующие выводы:

1. В языковом поле профессиональная метафора представляется как результат корреляции лингвистической реальности и концептуального конфликта, выраженного в специфической форме конкретной языковой единицей. В зависимости от контекстной локализации лингвистическая форма исследуемого феномена способна редуцироваться до уровня аббревиатур, сохраняя при этом метафорическую сущность и целостность воспринимаемого профессионального феномена. 2. Профессиональные метафоры, возникающие в научной речи специалистов, репрезентируют теоретическое знание о профессиональных объектах и явлениях. Однако данное знание актуализируется в них не логическим, рациональным путем, а метафорически, через создание яркого, запоминающегося образа профессионального понятия. Значение профессиональной метафоры имеет феноменологический характер и конструируется говорящим в конкретной профессионально-речевой ситуации с учетом особенностей этой речевой ситуации. 3. Специфика функционирования профессиональной метафоры в индивидуальном сознании (подсознании) зависит, в первую очередь, не от характеристик метафоры как элемента языка, а от взаимодействия носителя языка с окружающим миром.

По результатам второй части экспериментального исследования были сделаны следующие выводы: 1. Профессиональная метафора является чрезвычайно сложным и многогранным феноменом, основанным на результирующем синтезе индивидуальной, культурной и профессиональной означающих практик. 2. В семиотическом аспекте профессиональная метафора является единицей профессионального дискурса, усложняющей систему внутренней организации последнего. Между тем, наряду с устойчивым профессиональным смыслом, метафора несет в себе множество подвижных, изменчивых, индивидуальных смыслов, которые подлежат не реконструкции, но «производству» со стороны адресата на основе спонтанного обобщения. 3. Означивание профессиональной действительности с использованием профессиональной метафоры в языковом поле приобретает формы формализованных конструкций (использующихся в документообороте) и неформализованных конструкций, использующиеся преимущественно в неформальном общении специалистов. 4. Профессиональные метафоры закрепляют в языке национально-специфические реалии. Являясь репрезентацией «живого» знания, профессиональная метафора имеет универсальный характер внешней формы

(структурного соответствия) для различных лингвокультур. Вместе с тем, в особенностях идентифицирующей референции проявляются стереотипы отдельных культур.

Подводя итог, отметим, что профессиональная метафора представляет собой комплексную неэлементарную интегративную систему, включающую в себя семиотические, когнитивные и лингвистические составляющие, обеспечивающие её знаковость. Лингвистические

составляющие объединяют понятие и акустический образ метафоры, представляя знак линейно; семиотические – «обеспечивают» связь между двумя объектами в ментальном поле; когнитивные – соотнесение компонентов системы между собой в каждый конкретный момент. В связи с этим вопрос о природе метафоры – это, в той или иной мере, вопрос о когеренции элементов мысли и языка.

ВЗАИМОСВЯЗЬ ИНДИВИДУАЛЬНОГО ПРОФИЛЯ ЛАТЕРАЛЬНОЙ ОРГАНИЗАЦИИ И АДАПТАЦИОННЫХ СПОСОБНОСТЕЙ

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Проблема адаптивности как способности человека осуществлять адаптационные перестройки и приспосабливаться к изменяющимся условиям и характеру деятельности вызывает интерес в научной среде и имеет важное практическое значение. Данная способность обеспечивает высокий познавательный потенциал личности и является необходимым условием существования познавательных и творческих способностей. Адаптивность характеризуется высокой работоспособностью, устойчивостью к стрессогенным факторам внешней среды, высокой эмоциональной устойчивостью, развитыми коммуникативными навыками.

В качестве одного из механизмов адаптации к сложным условиям окружающей среды организм человека использует формирование собственных морфологических и функциональных асимметрий. А. Г. Кураев, И. В. Соболева (1996) относят адаптационные свойства к признакам, коррелируемым с профилем функциональной асимметрии мозга. Функциональная асимметрия полушарий является одной из причин существования у человека определенного латерального фенотипа (Симерницкая Э. Г. 1978). Индивидуальный латеральный профиль (профиль латеральной организации) – индивидуальное сочетание функциональной асимметрии полушарий, моторной и сенсорной асимметрии, которое определяет присущие только определенному индивидууму особенности поведения (Данилова Н. Н. 1992).

Нами была предпринята попытка выделения особенностей взаимосвязи индивидуального профиля латеральной организации и адаптационных способностей у педагогических

работников. Учитывая, что особенности индивидуального профиля латеральной организации взаимосвязаны с разными сферами психической деятельности и адаптивными характеристиками, они являются необходимыми и в сфере профессиональной деятельности педагогических работников.

Целью работы явилось исследование адаптивных способностей, детерминируемых межполушарными комбинациями асимметрий анализаторных систем мозга. Предметом исследования были индивидуально-типологические различия педагогических работников, обусловленные специализацией их полушарий мозга. Гипотеза исследования состояла в том, что разные варианты профилей латеральной организации должны иметь закономерные связи с особенностями адаптации педагогических работников в профессиональной среде.

Были использованы психофизиологические и психологические методы исследования. Для оценки адаптационных возможностей испытуемых был использован многоуровневый личностный опросник «Адаптивность». Для определения функциональной асимметрии и типа индивидуального профиля латеральной организации использовалась программа компьютерного тестирования «Профиль». В работе исследовалась мануальная, зрительная и слуховая асимметрии.

В качестве испытуемых в исследовании выступили лица женского пола в возрасте от 22 до 66 лет. Количество участников составило 21 человек, в число которых вошли методисты и психологи Дворца творчества детей и молодежи Ростова-на-Дону, имеющие первую и высшую квалификационную степень. Средний возраст испытуемых в выборке составил 44,1 года.

У исследуемой группы педагогических работников значительно преобладает (71,5%)

парциальный профиль функциональной межполушарной асимметрии с преобладанием правых признаков, следовательно, доминирующим в этом случае является левое полушарие. Более высокая моральная нормативность, нервно-психическая устойчивость и адаптивный потенциал в целом отмечены у лиц с правосторонней асимметрией в индивидуальном латеральном профиле организации.

Результаты факторного анализа данных по методикам «Адаптивность» и тест Аннет программы «Профиль» показали, что наибольшая выраженность показателей поведенческой регуляции и личностного адаптационного потенциала соответствует выраженной праворукости. Полученные данные корреляционного анализа с использованием коэффициента ранговой корреляции Спирмена данных по методикам «Адаптивность» и тест Аннет программы «Профиль» позволяют сделать выводы о

том, что показатели социальной интроверсии и дезадаптационных нарушений нарастают по мере снижения показателей праворукости.

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ЛЕНТЫ МЁБИУСА В СОВРЕМЕННОЙ ПОЭЗИИ: ОБРАЗЫ, СЮЖЕТЫ, СТРУКТУРЫ

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Поэзия как способ познания находит разные возможности организации текста, соотносимые со структурами, которые изучаются естественными и точными науками. Лента Мёбиуса, сочетающая простоту с парадоксальностью, давно привлекает внимание философов, художников, писателей – как символ бесконечности, образ зеркально отраженных противоположностей, как метафора потустороннего мира и подсознания.

В докладе на примерах из поэзии 2-й половины XX– начала XXI в. рассматриваются: а) лента Мёбиуса как метафора и средство сравнения, б) как основа сюжета, в) как модель структуры и композиции текста.

Уподобления обычно основаны на переключенности ленты Мёбиуса, ее замкнутости, перевернутости предметов на разных точках ленты, парадоксальности. Чаще всего предметами сравнения являются время, пространство, жизнь. Одномерности ленты, вероятно, соответствует переход противоположностей друг в друга: устраняются многие оппозиции (верх – низ, прошлое – будущее, динамика – статика, живое – мертвое, причина – следствие, субъект – объект и т.д.). В поэзии упоминание ленты

часто сопровождается деформацией языковых единиц.

а). Образы. Б. Кенжеев, сравнивая жизнь с лентой Мёбиуса, показывает близость и различие понятий, названных однокоренными словами *обратно* и *наоборот*, *водка* и *вода*, обращает внимание на превращение античных имен в бренды: *А еще сказал кифаред, белозуб и чернобород, / что обратно дороги нет, есть дорога – наоборот. // Выпью водки, запью водкой <...> / Я ослышался? Ты – орфей, как недорогое кафе? Своя / казнь всякому, пей, не пей, – вечные мёбиусовские края.*

В стихотворении Е. Клюева «Часовой пояс» речь идет о парадоксе смещенного времени при перелете в другую страну: *в три поднялся с земли – приземляешься в три часа! / <...> снова – здравствуйте, Мёбиус; снова – живи-скачай / по неведомым странам, в которых не побывал, / снова – думай, что жизнь бесконечно во всем права <...> / вот и здесь скоро три пополудни... так же, как там – / там, откуда ты так и не улети.* Фрагмент *снова – здравствуйте, Мёбиус* является трансформацией выражения *снова здорово*. Возможно, и слова *бесконечно во всем права* здесь имеют не только аксиологическое, но и пространственное значение.

Тотальная деформация слов представлена в финале пятичастного стихотворения Е. Клюева «Фортуна». В последней из них, с абсурдным

подзаголовком «Пятая четверть, черновик», упоминание ленты Мёбиуса сопровождается фигурами перемещения с тенденцией к глоссологии – анаграммами, метатезами, верланами: *О себе сказать / вне ленты мёбиуса, / что вдох и выход / там же где вход и выход / неба впадает в окно. / А Колтуны Фаресо кружёт ежится – / только скошенная берость Колтуны / теснавается предперь поненятной / и чужёйкой, и датой, и даль такие...*

б). **Сюжеты.** Среди текстов, озаглавленных «Лента Мёбиуса», сюжетообразование по модели этой ленты наиболее отчетливо представлено в стихотворении О. Григорьева. Автор рассказывает о стрессе, изменившем сознание: *Снег с дождем хлестал в первомой, / Посколькунулся и чуть не попал под автобус я / Проехал по галоше моей трамвай, / Галоша превратилась в ленту Мёбиуса.* <...> *Вывернулся наизнанку я с этой галошей // <...> И смотрю на себя в окно, / Где я другой, как в кино <...> // И тут же большая гора, / И я на вершине горы / Но эта гора – дыра, / И я на дне той дыры, / То есть дырогоры или городыры.* // *Мать говорит: / – Ну что же ты, безобразник! / На тебе, / На тебе, / На тебе, / На! – / Но это не мать, а жена. / Трясет, на работу будит. / И даже еще не жена, / А то, что еще когда-то женою будет // <...> Ощупал себя – и я мертвец. <...> // А рядом Катя, которая Коля, который Лена. / Вдруг из меня вырастает полено / И превращается в новогоднюю елку, / И я как бы крест к этой елке. / Все лезу, лезу и лезу на верхнюю полку, / Как на листе нарисованный, / Детьми совершенно спрессованный.* Изображение переключенной галоши порождает сюжет, в котором персонаж воспринимает время и пространство, а также всё происходящее как совмещение деформированных противоположностей. Описание сновидения напоминает гипотезу П. Флоренского о том, что во сне ирреальное время обратно реальному (2001: 524–528)¹. Вывернутое пространство обозначено и неологизмами-оксюморонами *дырогоры* или *городыры*. Устранение оппозиции «мужское – женское» выражено не только вербально, но и противоречивой референцией грамматического рода местоимений: *А рядом Катя, которая Коля, который Лена.*

в). **Структуры.** Однострочное стихотворение И. Жданова *Я нужен тебе для того, чтобы ты была мне нужна* под заголовком «Лента Мёбиуса», указывает на структурное подобие хиазма этому топологическому объекту.

Кроме того, встречаются тексты, структура которых напоминает свойства ленты Мёбиуса, хотя лента Мёбиуса не названа и, скорее всего, не имела в виду.

В стихотворении Д. Быкова «Обратный отсчет» можно видеть и сюжетное, и композиционное подобие ленты. В первой половине текста говорится о нарастающем отчаянии, во второй – о нарастании оптимизма и вдохновения. Каждая из шести строф первой части уменьшается на одну строку и заканчивается односложным словом, а каждая из шести строф второй части увеличивается на одну строку и начинается односложным словом. Середина текста изображает переломный момент: *Однажды приходит чувство, что вот и оно – / Дно. // Но! // Йес. // В одно прекрасное утро идет обратный процесс.* Заканчивается стихотворение указанием на замкнутость: *А если я больше не выйду из ада, / То так мне и надо.* На стыке частей с зеркально противоположной структурой одно слово переходит в другое (*оно* → *дно* → *но*), русский противительный союз омонимичен английскому отрицанию (*оно же – и* вводное слово), за отрицанием следует утверждение (*Но! // Йес*), линия поворота (в ленте Мёбиуса заметная только на рисунке или фотографии) оказывается как бы двуязычной.

Стихотворение А. Левина демонстрирует замкнутость линейно развертываемого текста, парадоксально создаваемую разорванностью начального и одновременно финального слова: *гда удастся предотвратить заикливание. / суть в том, чтобы избежать однообразных действий. / Не возвращаться той же дорогой, по которой уходил. <...> Может быть, тог.* Тем самым создается напряжение между дискретностью слова и континуальностью текста.

В стихотворении В. Павловой *на руках / за ручку / за руку / под руку / рука об руку / на руках / из-под руки / из рук в руки / по рукам / из рук вон / на руках / в руке* сочетание *на руках* отнесено к трем семиотически важным переходным ситуациям (началу, кульминации и концу жизни). Различие означаемых при тождестве означающих указывает на изоморфность прямого и обратного направлений.

Выводы. Итак, в современной поэзии образы и сюжеты с упоминанием ленты Мёбиуса, а также структура некоторых произведений без этого термина воплощаются в различных тропах, фигурах, в устранении оппозиций, в иконическом соответствии содержания и вербальных элементов текстов этому парадоксальному топологическому объекту как образу мироздания, объединяющему семиотику зеркала и круга.

¹ Флоренский П.А. 2001. Христианство и культура. М.: Фолио.

КОГНИТИВНОСТЬ СИНЕСТЕЗИИ В СОВРЕМЕННОЙ ПОЭЗИИ

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Существование выраженной зависимости языковых явлений от состояния сознания (Д. Л. Спивак) позволяет утверждать, что поэтические тексты часто имеют языковые особенности, свидетельствующие о необычном режиме перцептивной и когнитивной деятельности автора, а именно об измененном состоянии сознания. Одна из таких особенностей – синестезия, обусловленная совмещением разных каналов восприятия. В научной литературе синестезия рассматривается и как результат мыслительной деятельности (Б. М. Галеев и др.), и как сенсорно-перцептивное соощущение без участия мышления (А. Р. Лурия и др.). Независимо от того, какова природа синестезии, применительно к поэзии когнитивный аспект исключить невозможно.

Синестезия свойственна архаическим глубинным пластам сознания и младенческому восприятию действительности. Установлено, что человек рождается синестетом, и только к 8–ми месяцам его сенсорные каналы сепарируются (Н. Сойнова). И архаическое, и детское мировосприятие в значительной степени представлены в поэзии, однако те способы восприятия и познания, которые в исходном состоянии были предпосылкой будущего развития, становятся в позднейшей культуре итогом развития (разумеется, не окончательным): на архетипический способ восприятия накладываются философская, психологическая, языковая рефлексия, множество культурных ассоциаций.

В современной поэзии (начиная со второй половины XX века) синестезия отражена очень широко, наиболее выразительно и многообразно – в поэзии Б. Ахмадулиной, В. Сосноры, В. Кальпиди, А. Кабанова, В. Гандельсмана, А. Полякова. Встречаются тексты, которые явно описывают обусловленность синестетических ощущений как восприятия действительности в измененном состоянии сознания, например: *Придет ко мне безумное дыханье/и кровь по жилам потечет бойчей, /беспаузное птичье щебетанье/услышу оглушительно ярчей* (В. Бауэр). Обычно синестезия представлена в тропах, преимущественно эпитетах и метафорах (*Нашла я доску, на которой режут/хозяйки снесь на ужинной заре, –/и заболел какой-то серый скрежет/в сплетенье солнц, в дыхательном ребре* – Б. Ахмадулина); фигурах, особенно этимологических (*Нагота твоя стынет на быстром*

морозе стыда – В. Кальпиди); авторском словообразовании (*темножужжание слов* – А. Поляков), в том числе с фонетической деформацией слова (*мягкий локот радио* [вместо *роко́т*] – С. Круглов). Синестезия часто порождает дефисные конструкции на границе словообразования и синтаксиса (... *Тяжелая шпалера –/нет, парча/старая так ало-тусклосеро-/серебристо-горяча!* – А. Пурин).

Соощущения, изображенные поэтами, затрагивают все известные каналы восприятия. Но сенсорные модальности в рассмотренных текстах (примерно 50 авторов) неравноправны – в совмещенных сенсорных образах один из них обычно доминирует. Зрительная и слуховая модальности наиболее склонны к доминированию: часто зрительный образ воспринимается через слуховой (*Я люблю как зовёт себя птица/на краю оглушительной тьмы* – А. Поляков), а слуховое восприятие идет по зрительному каналу (*Как в ушах еще темно* – И. Булатовский). Обоняние в наших примерах из поэзии не доминирует: запахи определяются через зрительные образы (*Дождь светло пахнет, /Слепо, красиво* – Н. Делаланд), звуковые, в том числе метонимические (*Лишь пахнет тишиной и соловьями/бульдозер в Ботаническом саду* – А. Кабанов), вкусовые (*Тридцать шесть квадратных эм наперечет/Пахнут сытно, как на бойне городской.* – М. Степанова), тактильные (*Запах хлеба жарок и печен* – Ю. Кунина) и т. д., примеров обратной зависимости не обнаружено.

Возможность кожного зрения (*поднимаю веки прозревшей кожи, /чешуей очей библейски одета* – В. Павлова) демонстрирует не только предельную обнаженность тела, но и характеризует состояние сознания как измененное – с отсылкой к сакральной архаике. Способность глаз к осязанию (*У мужчин глаза – орган осязанья. /У женщин глаза – орган слуха* – В. Павлова) позволяет автору подчеркнуть экстраверсию мужского начала в противовес внимающему слуху – принимающему женскому началу. Синестезия опредмечивает непредметное, – то, что воспринимается не само по себе, а только по своим действиям (*Ветер оранжевый, ветер лиловый и терпкий* – Д. Паташинский), абстрактное представляет конкретным: *Пахнет временем, а время – холодком* (В. Ханан), в том числе при обозначении эмоций, этических понятий (*А запаха стыда, бесшумные вокруг* – В. Кальпиди).

Синестезия осуществляет и «магическую» функцию языка, характеризуя, например, действия, обозначенные перформативными

глаголами (... *Хотел сказать: Свеча, – / да спички почему-то отсырели, / хотел на **ощупь** **вымолвить**: Гори!..* – А. Кабанов). Указание на телесность, которое появляется при обращении к совмещенным модальностям, усиливается изображением артикуляции (*на **ощупь** **вымолвить***) и имплицитному указанию на зрение.

Многие ощущения (голод, сытость, бодрость, сонливость), обычно не связанные со зрением, слухом, осязанием, обонянием, вкусом, в поэзии эту связь обнаруживают: *и **голодному** **слуху** далекая музыка **брезжит*** (В. Кривулин). При подобном словоупотреблении, расширяющем референцию означающего, увеличивается и объем значения слова. В некоторых случаях это оказывается восстановлением прежнего, свойственного древнерусскому языку широкого значения слова: *но **ярче** всех шагов земли **слышны** твои твои* (Д. Строчев). Раньше слово *яркий* обозначало интенсивное проявление признака, воспринимаемого не только зрением (ср. *ярый*).

Синестезия в поэзии почти всегда является эффективным средством текстовой компрессии: *И санитарная карета / **Полным-бела, больным-полна*** (Д. Болотов).

Содержание текстов отчетливо отражает тенденцию к синестетическому изображению кризисных моментов в жизни человека, к изображению природных трансформаций, а также ко всему, что проявляет себя максимально интенсивно. В связи с этим активизируются особые стиховые структуры, например, анжамбеман: *как-то так **жизнь ломается сразу так что на изломе пахнет / сладкой тоскою*** (А. Месропян). Характерно, что синестезия в поэтических тропах часто связывается с изображением смерти (ср. синестетическое

название заупокойной молитвы «Свете тихий»). Особенно отчетливо эта связь обнаруживается в стихах В. Кальпиди, в поэзии которого преобладают апокалиптические образы развоплощения и метаморфоз: *Цветы сквозь воду продают жест, / **развоплощенный в нитевидный запах***.

Поэты часто изображают отключение какого-либо органа чувств и возмещение утраты другим каналом восприятия: *Оглушающе пусто, ослепительно тихо окрест, / только вьётся в слепой пустоте, как зыбучая пена, / **зримый только на звук** духовой комариный оркестр, / без пюпитров и нот истязаящий марши Шопена* (В. Строчков).

Синестезия – психосоматическое явление, основанное и на свойствах сознания, и на свойствах тела, поэтому синестетическое словоупотребление выводит читателя или слушателя в пространство смысла, находящегося в области трансцендентного, невысказываемого, и позволяет на языковом уровне как бы пережить его телесность.

Таким образом, синестезия в поэзии – одно из убедительных свидетельств измененного состояния сознания, в котором пишутся стихи. Все проявления синестезии в поэтических текстах могут быть катализатором измененного состояния сознания читателя, т. е. быть одним из проявлений суггестивного потенциала поэзии. В эволюции языка синестезия способствует развитию полисемии.

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АВТОНОМНОСТЬ СИСТЕМ ОПОЗНАНИЯ И ВЕРБАЛИЗАЦИИ ЭМОЦИЙ

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В настоящее время наблюдается рост интереса гуманитарных наук к вопросам, связанным с изучением эмоциональной сферы. Представляется, что психологические исследования должны стать во главе этого поворота, ознаменованного отходом от господства интеллекта и признанием ценности эмоциональной составляющей человеческой жизни (Российская

империя чувств, 2010). Разработанные в рамках психологии методы, в том числе применимые для экспериментального исследования эмоций и чувств, несмотря на динамичность, многообразие и выраженные индивидуальные особенности их протекания, позволяют вскрывать важные механизмы и закономерности обретения человеком опыта переживаний, а также прогнозировать влияние аффективной составляющей на мышление, поведение и развитие личности.

В ходе предыдущих исследований (Иванова Е. С., 2010, 2011) на выборке, составившей 340 испытуемых, нами был выявлен феномен автономности способности опознавать

эмоции по лицевой экспрессии и способности вербализировать эмоциональный опыт в виде эмотивов-номинативов. На нескольких возрастных группах (18–21 год, 25–35 лет) были получены результаты, убедительно доказывающие, что объем активного словаря эмоций, выявляемый нами с помощью направленного ассоциативного эксперимента, и количество точно опознаваемых фотографий лицевой экспрессии – совершенно независимые показатели. Разбиение общей выборки испытуемых по критериям пола, возраста, профессиональных интересов также не выявило никакой взаимосвязи между тем, какие эмоции человек репрезентирует посредством эмотивов-номинативов (что предполагает в некоторой степени сформированные знания о том, какие именно переживания стоят за языковыми знаками – названиями эмоций и чувств) и тем, лицевые коды каких эмоций он способен опознать (что обусловлено сформированностью *сенсорного эталона* и достаточным уровнем развития *перцептивно-коммуникативных навыков*).

Полученные результаты побуждают продолжить углубленное исследование процессов формирования и взаимодействия двух систем знаний об эмоциях – невербальной (в данном случае рассматриваемой с позиций сенсорного опыта восприятия лицевой экспрессии) и вербальной (в которой информация об эмоциях представлена в виде устойчивых знаков в системе языка – слов, непосредственно называющих эмоции). Для решения этой задачи и получения убедительных доказательств автономности систем опознания и вербализации эмоций было запланировано и реализуется при поддержке РГНФ исследование, сочетающее анализ данных микровозрастных срезов и лонгитюдного эксперимента, в котором в качестве испытуемых выступают учащиеся школы с 1-го по 11-й класс. В рамках указанного проекта с целью получения данных для углубленного анализа проблемы разработан специализированный экспериментальный подход, согласно которому испытуемым для опознания предъявляются фотографии лицевой экспрессии тех эмоций, которые они непосредственно называют в процессе направленного ассоциирования.

Предварительные результаты, полученные в ходе первого года исследования в четырех возрастных группах: 7–8 лет, 10–11 лет, 13–14 лет, 16–17 лет (всего 420 испытуемых), позволяют заключить, что система вербализованных знаний об эмоциях, отраженная в активном словаре эмоций, и система перцептивных знаний, зафиксированная в опознаваемых мимических

проявлениях эмоций, демонстрируют существенную автономность, начиная с младшего дошкольного возраста.

Для выборки испытуемых 7–8 лет следует отметить относительно низкий процент совпадения эмоций, репрезентированных вербально и опознанных по лицевой экспрессии – обобщенный показатель по всей выборке первокурсников составил 43% от количества слов, называемых каждым ребенком для обозначения эмоций и чувств. В случае очень маленького объема индивидуального словаря эмоций (3–4 единицы) совпадения вербализованных и опознанных эмоций были полными, а при увеличении свыше 6 единиц – степень совпадения снижалась до 25–33%. Это означает, что при относительно развитом словаре эмоций ребенок 7–8 лет не всегда способен соотнести вербальные знаки – названия переживаний – с невербальными (визуальными) формами репрезентации этих эмоций, чувств, состояний.

Аналогичным образом выстраивается картина и для остальных возрастных групп: объем вербализуемых знаний об эмоциях существенно опережает способность точно распознавать коды лицевой экспрессии данных переживаний. Необходимо подчеркнуть, что в каждой обследованной возрастной категории наблюдаются существенные гендерные различия объемов активного словаря эмоций у мальчиков и девочек, юношей и девушек, а именно: девочки и девушки называют существенно больше эмотивов, чем их сверстники мужского пола. Что касается способности опознавать лицевую экспрессию, то гендерные различия уже не столь выражены. В младшем школьном возрасте различия несущественны – в силу небольшой точности опознания лицевой экспрессии в целом. В подростковом возрасте девушки, в среднем по группе, опознают больше, чем юноши, но разброс индивидуальных значений слишком велик, поэтому гендерные различия не достигают уровня значимости. И только в старшем школьном возрасте можно наблюдать ситуацию, когда девушки и больше называют, и больше опознают эмоций, чем юноши. Тем не менее, корреляции между этими показателями остаются слабыми, что позволяет говорить о независимости функционирования систем опознания и вербализации эмоций.

Очевидно, полученные данные указывают на разные мозговые механизмы обработки, хранения и использования информации об эмоциях, в том числе с целью сопоставления данных, получаемых из этих автономных систем, что обеспечивает более точную и критическую

оценку сигналов, поступающих от партнеров по общению, позволяет глубже проникать в их истинные намерения, выявлять ложную информацию, более верно прогнозировать ход развития событий. Полученные данные хорошо соотносятся с подходом И.П. Павлова, утверждавшим функциональные и морфологические различия структур, обеспечивающих первосигнальные и второсигнальные коммуникации.

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ВЗАИМОДЕЙСТВИЕ КОЛЛЕКТИВНОЙ И ИНДИВИДУАЛЬНОЙ ПАМЯТИ

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Индивидуальная память является понятием, хорошо изученным в психологии. К настоящему моменту накоплен достаточно большой теоретический и эмпирический материал о ее процессах, видах, особенностях и свойствах. Понятие коллективной памяти, введенное в научный дискурс М. Хальбваксом еще в середине 20-х годов XX столетия, в течение длительного времени оставалось практически не употребляемым, в том числе и в психологии (1992). Хальбвакс считал (2005), что любому индивиду доступны два вида памяти – индивидуальная и коллективная. Индивидуальная память связана с личностью, индивидуальным опытом, личной жизнью. Однако индивидуальная память не является чисто индивидуальным процессом, ее деятельность определяется обществом, и она является социально детерминированной. В этом идеи Хальбвакса перекликаются с идеями Л. С. Выготского, П. Жане и др.

Как, с помощью каких средств осуществляется такая детерминация? М. Хальбвакс вводит понятие рамки, которую составляют устойчивые воспоминания, представляющие интерес для всего общества, Дж. Брунер говорит о схемах, на основе которых индивид конструирует свои воспоминания («припоминает»). Продолжая эту линию, Дж. Верч (2002) разработал понятие схематической нарративной матрицы (*schematic narrative template*), с помощью которой группа строит свои воспоминания.

Будь то рамка, или схема, или матрица, они являются средством, опосредующим конструирование индивидуальных воспоминаний. Особенно явно этот механизм проявляется в

памяти об исторических событиях. В зависимости от времени и ситуации общество по-разному представляет себе прошлое, оно меняет рамки и схемы, а вместе с ним и отдельные индивиды переконструируют свои воспоминания вместе с изменениями коллективной памяти и ее рамок. Мы предположили, что не только коллективная память оказывает влияние на индивидуальную память, но что между ними осуществляется взаимодействие

Предметом нашего эмпирического исследования было взаимодействие коллективной и индивидуальной памяти.

Цель исследования – установить влияние коллективной памяти и ее изменений на индивидуальную память и влияние индивидуальной памяти на коллективную.

Материалом для проведения эмпирического исследования стала память о Второй мировой войне. Данный выбор был связан со следующими обстоятельствами. В советское время в коллективной памяти жителей Советского Союза существовала Великая Отечественная война. Это была официальная версия, которая прочно запечатлелась в индивидуальной памяти людей и передавалась последующим поколениям. Эта версия поддерживалась с помощью разных средств, в том числе нарратив именно о Великой Отечественной войне был представлен и в учебниках истории как одном из наиболее консервативных средств поддержания коллективной памяти.

После распада Советского Союза в официальной украинской истории нарратив о Второй мировой войне начал вытеснять нарратив о Великой Отечественной войне. Это нашло отражение и в СМИ, и в учебниках истории, которые задают определенные схемы или рамки коллективной памяти об исторических событиях. И в публичном дискурсе, и в новых

украинских учебниках истории речь идет уже о Второй мировой войне. Складывается ситуация сосуществования двух разных схем памяти о войне: старой, о Великой Отечественной войне, и новой, о Второй мировой. Какая схема или какие схемы влияют на индивидуальную память молодежи и как?

В качестве метода сбора эмпирических данных было выбрано написание сочинений-эссе о Второй мировой войне. Студентам разных высших учебных заведений г. Харькова, разных специальностей, кроме исторических, было предложено написать о Второй мировой войне. Всего в исследовании приняли участие 77 человек. Эмпирическое исследование проходило в два этапа: первый этап – в 1999 году, второй – в 2011-м. Методами обработки полученных сочинений были качественные методы: качественный контент-анализ и элементы анализа нарратива. Приведем сравнительные данные.

Сочинения, написанные в 1999 году, более информативны, логичны и структурированы. Студенты помнят и приводят больше фактической информации, причем она касается как фактов о Великой Отечественной войне (битва под Москвой, Сталинградская битва, блокада Ленинграда и т.д.), так и тех, которые в советское время в официальной истории не упоминались (например, пакт Молотова-Риббентропа, роль второго фронта, причины неудач в начале Великой Отечественной войны, которые связываются с репрессиями высшего командного состава и т.д.). Они достаточно четко разделяют, приводя соответствующие даты и события, Великую Отечественную войну и Вторую мировую войну. Можно сделать вывод о том, что в данном случае наблюдается сосуществование двух разных рамок (или схем) и в коллективной, и в индивидуальной памяти, и события, которые вспоминаются людьми, разделяются соответственно этим рамкам.

Молодые люди в 2011 году помнят гораздо меньше фактического материала, во многих случаях стараются вообще без него обходиться, просто выражая свои эмоции и чувства по поводу войны. Если фактические данные все же

воспроизводятся, то за редкими исключениями путаются данные о Второй мировой и Великой Отечественной войне. Называются даты одной, а пишут о другой. Все (кроме одного человека) написали, что Вторая мировая война закончилась 9 мая. Это свидетельствует о том, что в настоящее время в сознании и памяти молодых людей, во всяком случае, участвовавших в исследовании, нет четкого разграничения между этими двумя событиями. Это может быть связано с тем, что в настоящее время в украинском обществе отмечается наличие двух вариантов коллективной памяти о войне (как Великой Отечественной и как Второй мировой), которые представляют собой, по выражению Дж. Верча (2002) соперничающие варианты. В ситуации присвоения этих рамок они размываются в индивидуальной памяти, и полученная в результате рамка представляют собой своего рода синкрет из двух соперничающих.

В 2011 году молодые люди включают в свои сочинения элементы семейной памяти (рассказы родственников и близких, переживших войну), чего практически не наблюдалось ранее, поскольку публичная и приватная сферы были резко разделены. В настоящее время семейная память начинает проникать в публичный дискурс, сближая публичную и приватную сферы, наполняя публичный дискурс эмоциональной и личностной окраской. Так постепенно индивидуальная память начинает влиять на коллективную, привнося в нее свое содержание.

Таким образом, коллективная и индивидуальная память оказывают взаимное влияние друг на друга: коллективная память является той рамкой, которая задает основное направление и содержание, а индивидуальная память насыщает эту рамку своим содержанием, чувствами и эмоциональной окраской.

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РЕГИСТРАЦИЯ ЭКСПРЕССИИ ГЕНОВ В МОЗГЕ С ПОМОЩЬЮ НОВОГО ВОЛОКОННО-ОПТИЧЕСКОГО МЕТОДА

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Для решения вопросов о клеточных и молекулярных механизмах научения и других когнитивных процессов необходимы подходы, позволяющие оценивать активность клеток мозга при выполнении животными различных задач. Методы электрофизиологии позволяют регистрировать электрическую активность целого мозга или отдельных нейронов у животных в свободном поведении, например, при приобретении нового опыта. При этом классические методы изучения биохимических и генетических процессов протекающих в мозге, либо не обладают достаточным разрешением, либо возможны только на срезах и образцах мозга *post mortem*. Одним из подходов, разработанных в последнее время, является оптическая регистрация различных флуоресцентных маркеров, позволяющих визуализировать различные процессы, протекающие в нейронах. Однако существующие способы такой визуализации либо не позволяют проводить исследования на одном и том же животном в течение долгого времени, либо требуют жесткой фиксации животных.

Данная работа была направлена на создание нового волоконно-оптического сенсора для решения задач *in vivo* визуализации процессов, протекающих в нейронах. В работе

использовали самцов трансгенных мышей линии Tg (Egr1-EGFP) 60Gsat/Mmcd, у которых ген флуоресцентного белка eGFP встроен под промотор немедленно раннего гена zif/268. Перед началом эксперимента в интересующую область мозга животным под наркозом вживляли оптоволоконно, закреплённое в специальном коннекторе (рис. 1). Возбуждение осуществляли непрерывным излучением второй гармоники Nd: YAG лазера на длине волны 473 нм; сбор люминесцентного отклика осуществлялся тем же волокном, регистрацию проводили с помощью ФЭУ (рис. 2). Использовали волокно диаметром оболочки 125 мкм и сердцевины 50 мкм. Предложенный метод крепления позволял проводить регистрацию из одной и той же области мозга на протяжении длительного времени (до нескольких недель). Была показана возможность длительной регистрации флуоресцентного сигнала eGFP в области CA1 гиппокампа у животных в свободном поведении в домашней клетке. При этом сигнал оставался стабильным на протяжении всего времени регистрации. Кроме того, показано равномерное снижение уровня флуоресценции в области CA1 гиппокампа в ответ на световую депривацию. При этом электрокожное раздражение или введение судорожного агента пентилентетразола вызывало достоверное усиление флуоресценции eGFP в гиппокампе, а стимуляции вибрисс – в бочонковых полях соматосенсорной коры, что согласуется с данными о возможности индукции Zif/268.

Таким образом, в данной работе был предложен новый метод для регистрации активности клеток мозга в бодрствующем мозге, а

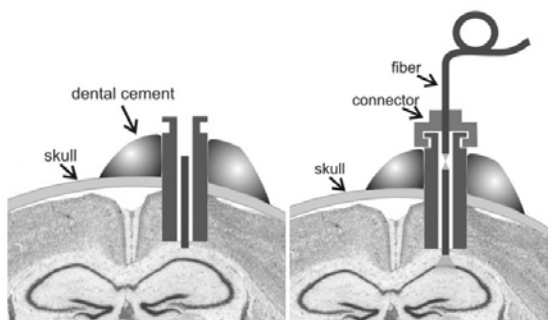


Рис. 1. Схема крепления оптического волокна к черепу мыши.

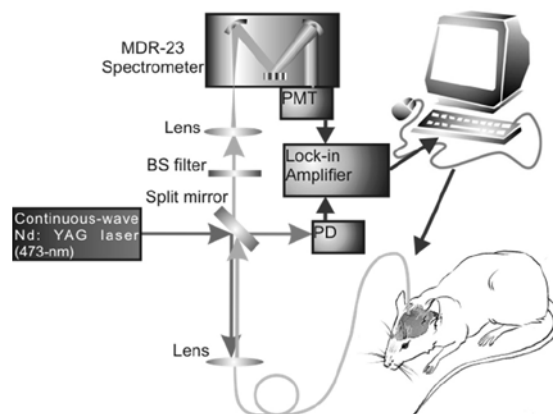


Рис. 2. Схема установки для регистрации.

также показана его эффективность для изучения процессов экспрессии генов. Используемый в данной работе подход может быть применён для изучения биохимических и генетических

процессов, происходящих в нейронах животных в моменты обучения и решения сложных когнитивных задач.

РОЛЬ КОГНИТИВНОГО КОНФЛИКТА В ОСОЗНАНИИ ИМПЛИЦИТНОГО ЗНАНИЯ

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В исследованиях процесса формирования понятий были получены данные о том, что, решая соответствующие когнитивные задачи, человек получает не только эксплицитное, но и имплицитное знание о структуре материала, с которым работает. В частности, в исследовании В.Ф. Петренко было показано, что, даже если человек не может сформулировать искомое свойство, он приобретает имплицитное знание о нём, которое помогает ему давать верные ответы в большом проценте случаев (Петренко, 1974). Аналогичный феномен достаточно давно известен в когнитивной психологии под названием «имплицитного научения». Значительная часть современных работ по имплицитному научению посвящена изучению соотношения имплицитного и эксплицитного знания, формирующегося в процессе познания (см., например, Rüniger 2011). Однако проблеме осознания имплицитного знания посвящено не так много исследований. Цель настоящей работы – восполнить этот пробел.

В классических и современных работах подчёркивается, что сознание необходимо человеку для контроля над ситуациями, в которых привычные, автоматические программы деятельности сталкиваются с препятствиями. Мы предположили, что столкновение человека с опытом, противоречащим его имплицитным знаниям, может способствовать их переводу в осознанный план. Одна из форм такого опыта – ложная обратная связь. В ответ на привычный ответ испытуемый получает неожиданный сигнал «имеющееся знание ложно!». Но конфликт в имплицитном знании может возникать также и между разными его компонентами, если в ходе научения согласованные ранее параметры ситуации начнут противоречить друг другу. Этот вариант конфликта аналогичен эффекту многозначности, который может быть снят вмешательством сознания (о снижении многозначности информации при сознательной обработке см. Аллахвердов 1993). Таким образом, в нашем

эксперименте мы проверяли две гипотезы: к осознанию устойчивого имплицитного знания ведёт 1) опровергающая его информация в виде ложной обратной связи; 2) столкновение с опытом, вызывающим конфликт между его разными компонентами.

Для проверки этих предположений был проведен эксперимент, в котором на первом этапе у испытуемых формировалось имплицитное знание об особенностях предъявленных стимулов, а на втором – они сталкивались с опытом, противоречащим полученному знанию. Использовалась модифицированная методика формирования понятий. В эксперименте приняли участие 78 добровольцев (30 мужчин и 48 женщин от 18 до 24 лет). В качестве стимульного материала выступали геометрические фигуры, предъявляемые на экране компьютера. Фигуры различались рядом свойств (размер, цвет, форма и т.д.).

Эксперимент состоял из двух этапов, в каждом из которых предъявлялось 30 фигур. Экспериментатор загадывал геометрическое свойство (невывуклость), которое должен был угадать испытуемый. После предъявления каждой фигуры испытуемый выдвигал предположение о том, обладает ли предъявленная фигура загаданным свойством. Затем он получал обратную связь об истинности своего предположения («верно» или «неверно»). После первого этапа испытуемые могли сформулировать свои гипотезы о загаданном свойстве. На втором этапе свою гипотезу можно было указать после каждой пробы.

Испытуемые делились на две группы. В группе № 1 обратная связь всегда была истинной, в группе № 2 на втором этапе в 15% проб она была ложной.

На первом этапе у невыпуклых фигур всегда были прямые стороны (например, крест или звезда), в то время как невыпуклые округлые фигуры (названные нами «критическими» – например, полумесяц) появлялись только на втором этапе.

Мы ожидали, что испытуемые будут демонстрировать имплицитное научение в ходе

первого этапа (увеличение процента правильных ответов при неспособности назвать загаданное свойство). Если на осознание имплицитного знания влияет противоречие с реальностью, то мы ожидаем, что количество испытуемых, осознавших загаданное свойство (фактически решивших задачу), будет больше в группе № 2 (межгрупповой план). Если же фактором осознания является конфликт внутри имплицитного знания, то осознание загаданного свойства будет в большинстве случаев следовать сразу после предъявления «критических» фигур (внутригрупповой план).

Анализируя результаты, мы считали, что испытуемый решил задачу, если он формулировал свойство, близкое по смыслу к геометрической невыпуклости и не допускал ошибок в классификации фигур. Из 78 испытуемых на первом этапе задачу решили 14 человек, у остальных наблюдалось значимое снижение процента ошибок (ANOVA с повторными измерениями, $F = 3,736$, $df = 5$, $p = 0,006$). Как и ожидалось, на первом этапе эксперимента было зафиксировано имплицитное научение.

В группе № 1 искомое свойство в ходе второго этапа сформулировали 8 человек (25,8%), в группе № 2–6 (18,8%). Различия статистически не значимо. Таким образом, гипотеза о влиянии конфликта между имплицитным знанием и обратной связью не подтвердилась. Из 14 человек, решивших задачу на втором этапе, 11 сформулировали верную гипотезу сразу после встречи с «критическими» фигурами: в пробе с критической фигурой или сразу после неё (различия значимо, биномиальный критерий, $p = 0,047$). Время ответа при встрече с «критическими» фигурами не отличалось у них от среднего времени ответа по всем пробам (U Манна-Уитни, $p = 0,333$), что подтверждает неосознанный характер процессов,

приведших этих испытуемых к решению (они не имели сознательной цели развести эти свойства). Гипотезу № 2 мы считаем подтверждённой. Кроме того, мы проанализировали эмоциональные реакции испытуемых на разные типы фигур. Всего таких реакций было 35. Только 3 из них пришлось на пробы с неадекватной обратной связью. В то же время 16 из 35 случаев эмоциональных комментариев присутствовало в пробах с «критическими» фигурами (различия значимо, биномиальный критерий, $p = 0,003$). Этот факт согласуется с данными Тихомирова О. К. об эмоциональном предвосхищении решения (Тихомиров 1969) и подтверждает, что осознание имплицитного знания о загаданном свойстве было индуцировано именно «критическими» фигурами.

Результаты проведенного эксперимента подтвердили наше предположение о том, что имплицитное знание может быть осознано в случае столкновения с противоречием. Наши данные свидетельствуют о том, что такое противоречие должно возникать между разными компонентами имплицитного знания. Именно в этом случае к решению задачи подключается сознание, и уже на сознательном уровне принимается решение о том, какая из составляющих его знания послужит основой для ответа.

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ФЕНОМЕН ПРОСТРАНСТВЕННОЙ ИНТЕГРАЦИИ РАЗНЫХ ПО АМПЛИТУДНО-ВРЕМЕННЫМ ПАРАМЕТРАМ ГРАДУАЛЬНЫХ НЕЙРОФИЗИОЛОГИЧЕСКИХ ПРОЦЕССОВ ГОЛОВНОГО МОЗГА В МЕХАНИЗМАХ ПСИХИЧЕСКОГО ОТРАЖЕНИЯ

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Исследования в области психофизиологии конца XX века раскрыли значение понятия информационной составляющей как одного из

важнейших факторов, сближающих мировоззрение психологов и физиологов в понимании мозговых механизмов психического отражения. В соответствии с современными представлениями информационная составляющая включает процессы отражения мозгом внутренних состояний организма и воздействий на эти состояния самых разнообразных факторов окружающей

среды (Судаков К. В., 1999). Сформулированы А. А. Ухтомским (1923) в учении о доминанте теоретические положения о функциональных органах нервной системы и индивида радикально изменили представления о головном мозге как сложно организованной в пространстве динамической супрасистеме, располагающей широким спектром взаимодействия со столь же сложно организованной средой обитания. Современный уровень развития системной нейрофизиологии человека позволяет исследовать принципы и механизмы регуляторных функций головного мозга, раскрывающие особенности пространственно-временной организации, различающихся по амплитудно-временным параметрам градуальных процессов на разных уровнях структурно-функциональной организации ЦНС. Накопленные в этой области знания обеспечили возможность поиска мозговых феноменов, тесно связанных с механизмами психического отражения. Раскрытие иерархического принципа пространственно-временной организации разных по амплитудно-временным параметрам градуальных нейрофизиологических процессов, при различии их информационного содержания на разных уровнях структурно-функциональной организации, определило выбор «языков» мозга, позволяющих с наибольшей полнотой исследовать мозговые механизмы обеспечения состояния покоя, активного бодрствования, эмоций, процессов восприятия и внимания, памяти и вербальной ассоциативно-мыслительной деятельности, включая творчество (Бехтерева Н. П., 1971, 1988; Бехтерева Н. П. и др., 1977–2001; Аладжалова Н. А., 1979; Иваницкий А. М. и др., 1984, 2002; Ливанов М. Н., 1989; Илюхина В. А., 1990, 2010; Александров Ю. И., 1995, 2006; Цицерошин М. Н. и др., 2000; Прибрам К., 1975; Наатанен Р., 1997 и многие другие).

Изучение основных закономерностей соподчиненности и относительной независимости в пространственной организации разных по амплитудно-временным параметрам градуальных скоростных, медленных и сверхмедленных процессов, регистрируемых в различных зонах коры и подкорковых структур головного мозга, а также в корковых проекциях основных интегративных центров в отведении с поверхности головы, при выполнении вербальных психологических тестов, позволили дифференцировать вклад исследуемых феноменов в организацию простых и сложных видов психической деятельности. Это подтверждено результатами многолетних исследований

академика Н. П. Бехтеревой и ее школы при изучении принципов и механизмов организации корково-подкорковых систем со звеньями различной степени жесткости, участвующих в обеспечении эмоций, внимания, краткосрочной и долгосрочной памяти, вербальной ассоциативно-мыслительной деятельности (Бехтерева Н. П., 1971–2004).

В их число вошло изучение мозговых механизмов феномена детекции ошибок. Установлен иерархический принцип мозговой организации феномена детекции ошибок при реализации вербальной мнестической деятельности. Впервые этот феномен был описан Н. П. Бехтеревой и В. Б. Гречиным (1968) в прижизненно идентифицируемых зонах базальных ганглиев, при выполнении тестов на краткосрочную память, по параметрам локальной динамики сверхмедленных колебаний наличного кислорода, что свидетельствовало об особенностях локальных, воспроизводимых изменениях метаболических процессов при неправильном выполнении теста. На нейрональном уровне свойство детекции ошибок в тесте на опознание пороговых зрительных стимулов было обнаружено по опережению реакции нейронов базальных ганглиев на ошибку ранее, чем это обнаруживал сам человек. Этот феномен раскрывал вклад исследуемых нейронов в механизмы неверно принятого решения о значимости стимула (Бехтерева Н. П. и др., 1985). На системном уровне мозговые механизмы детекции ошибок и универсальность процессов, вовлеченных в выполнение ложного действия, были подтверждены по параметрам когнитивных вызванных потенциалов микровольтового диапазона (слабый сигнал), регистрируемых в корковых проекциях основных интегративных центров с поверхности головы (Киреев М. В. и др., 2008). Сходные закономерности иерархического принципа организации были выявлены при изучении мозговых механизмов, обеспечивающих реализацию: а) вербальной ассоциативно-мыслительной деятельности, связанной с ассоциацией слогов в слова (по параметрам воспроизводимых вызванных сверхмедленных колебаний потенциалов микровольтового диапазона); б) механизмов принятия решения о готовности к действию (по параметрам волны ожидания – феномен CNV), регистрируемых в структурах таламуса, стриопаллидума, в хвостатом ядре и в корковых проекциях лобной области при отведении с поверхности головы (Илюхина В. А., Хон Ю. В., 1973; Илюхина В. А., 2010). Использование динамического факторного анализа для изучения

пространственно-временной организации межнейронного взаимодействия в этих условиях позволило выявить характерные перестройки типов кооперации нейронных ансамблей, дискриминируемых первым и вторым факторами (Бунзен П. В. и др., 1975; Илюхина В. А., 2010). Установлено, что психологический и нейрофизиологический эквиваленты принятия решения о готовности к действию, свидетельствующие об оптимальном состоянии процессов произвольного внимания, отсутствовали в тех случаях, когда амплитуда спонтанных сверхмедленных колебаний потенциалов (СМКП) секундного диапазона в исследуемых зонах мозга превышала 100 мкВ. Наличие такого рода спонтанных СМКП свидетельствовало о локальном метаболическом напряжении в головном мозгу, характерном для лиц с эмоциональными расстройствами, при хроническом психоэмоциональном стрессе и для больных с

психическими заболеваниями (астено-ипохондрический синдром, нарколепсия).

Накопленные к настоящему времени знания позволяют рассматривать, доступные для измерения, разные по скоростям и интенсивности воспроизводимые взаимодействия импульсных и градуальных (волновых) нейрофизиологических феноменов в качестве основного способа неинвазивного, прижизненного изучения сложно организованного в пространстве и времени объемного движения информационно-управляющих систем головного мозга, которое, на наш взгляд, и является тем универсальным, многорегистровым содержанием «языков» мозга, составляющих сущность психического отражения окружающего нас мира, реализуемого в организации психологических эквивалентов функциональных состояний, познавательной деятельности и приспособительного поведения человека.

КОГНИТИВНЫЕ ПОТЕНЦИАЛЫ МОЗГА НА СИТУАЦИОННО-ЗНАЧИМУЮ ИНФОРМАЦИЮ

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В настоящее время проблема выявления ситуационно-значимой для субъекта информации (скрываемые знания, детекция лжи) в судебной практике, при профотборе или при проведении служебных расследований традиционно решается с использованием классических инструментальных методов — тестированием на полиграфе. В качестве ведущих процессов при выявлении значимой информации в разных школах и направлениях берутся различные психические функции и состояния, такие, как: внимание, рабочая память, инконгруэнтность предъявляемой семантической информации со следами эпизодической памяти, эмоциональные реакции и реакции активации. Несмотря на видимые различия в базовых конструктах, реальные практические выводы о лжи/правде всегда основываются на динамических изменениях показателей вегетативной НС. То есть коррелятами участия психических процессов и состояний, в процессе сокрытия значимой для субъекта информации, являются показатели эмоционального напряжения и стресса. Попытки найти надежные «прямые» когнитивные показатели скрываемых знаний ведутся с 80-х годов прошлого века и связаны с анализом

электроэнцефалограммы (ЭЭГ) и когнитивных вызванных потенциалов (КВП) мозга. В ряде работ (Rosenfeld J. P. et al. 1987, Farwell L. A., Donchin E. 1991, Rosenfeld J. P. 2000) было показано, что отдельные компоненты КВП и их амплитудно-временные характеристики могут служить индикаторами когнитивных процессов, отражающих принятие решения в ситуациях ложных и правдивых ответов на значимую для субъекта информацию. В то же время имеются данные о том, что конфигурация и распределение компонентов КВП по скальпу, их амплитуда и латенция значительно меняются в зависимости от целого ряда факторов (Kok A. 2001, Vendemia J. M. C., Buzan R. F. 2005). Изменение экспериментальной парадигмы, порядка предъявления стимульного материала и инструкции, условия регистрации и усреднения — все это значительно меняет анализируемые параметры КВП. Таким образом, с одной стороны, многозначность психологической и психофизиологической интерпретации механизмов и процессов, которые связаны с генерацией отдельных компонентов КВП порождает основную методологическую проблему использования КВП в детекции скрываемых знаний — проблему адекватной теоретической модели «психофизиологических механизмов» обмана. С другой стороны, высокая динамичность компонентов КВП в зависимости от индивидуальных

особенностей испытуемых, экспериментальной парадигмы, способов регистрации и обработки данных, ставит вопрос о поиске надежных методов анализа КВП.

В настоящем докладе представлены результаты экспериментального исследования по использованию КВП для выявления ситуационно-значимой информации в процессе намеренного обмана. Основной целью исследования была разработка математических алгоритмов анализа динамических изменений амплитудно-временных и пространственных характеристик индивидуальных КВП, зарегистрированных в ситуациях правдивого и ложного ответов. Методическая процедура регистрации КВП на ситуационно-значимые стимулы проводилась на аппаратно-программном комплексе фирмы «МЕДИКОМ-МТД». Запись ЭЭГ велась по 21 каналу, монополярно, с референтами А1, А2. Частота дискретизации – 250 Гц, частотный диапазон – от 0,16 до 30 Гц. Для контроля общего функционального состояния испытуемого и артефактов регистрировали электрокардиограмму, фотоплетизмограмму, кожно-гальваническую реакцию и электроокулограмму. В исследовании приняли участие 28 человек (20 женщин и 8 мужчин, средний возраст – 23 года). В качестве значимого стимула для женщин использовалось собственное имя испытуемой, для мужчин – его фамилия. Для повышения мотивации испытуемых создавалась определенная игровая ситуация. Испытуемому рассказывали про технологии и методы выявления лжи и предлагали поиграть в «разведчика». Сюжет игры: «Вы – разведчик. Вас подозревают в хищении секретных документов. Вы живете в стране под чужим именем (это ваш псевдоним). Неприятелю известно имя человека, похитившего документы, то есть ваше настоящее имя. Их специалистами написана компьютерная программа, которая по ответам мозга может определить, врет человек или говорит правду. Ваша задача – скрыть собственное имя и обмануть компьютер». Инструкция испытуемым: «Вам будут предъявлены на экране монитора различные имена (фамилии). Среди имен будут встречаться ваше собственное имя и выбранный вами псевдоним. На вопрос «Ваше имя – Татьяна?» вы должны отвечать отрицательно (если вас зовут Татьяна), нажимая клавишу «нет» (правая клавиша мыши). При предъявлении имени-псевдонима вы должны отвечать утвердительно, нажимая клавишу «да» (левая клавиша мыши). При предъявлении любых других имен вы отвечаете «нет» (правая клавиша мыши).

КВП на правдивые и ложные ответы обрабатывались с помощью модифицированных или специально разработанных математических алгоритмов. Основной подход к построению этих алгоритмов заключался в векторном представлении характеристик базисных компонентов КВП, информативных для различения правдивых и ложных ответов. Для поиска оптимального алгоритма обработки и статистического анализа КВП были апробированы различные способы математического построения векторов признаков ВП: а) построение вектора признаков, состоящего из коэффициентов оконного преобразования Фурье; б) построение вектора признаков, состоящего из коэффициентов вейвлет-преобразования; в) построение вектора признаков, состоящего из коэффициентов преобразования Эрмита.

В ходе поиска количественного критерия для выявления и оценки ситуационно-значимой информации по компонентам КВП и проведения статистического анализа индивидуальных и групповых данных были разработаны три оригинальных метода определения лжи на основе различных характеристик ЭЭГ и ВП: 1) метод анализа соотношений ритмов мозга (вероятность обнаружения лжи – 80%); 2) метод, основанный на машинном обучении (вероятность обнаружения лжи – 72%); 3) метод поиска отличий в ВП (вероятность обнаружения лжи – 82%). На основе корреляционного анализа результатов этих методов был разработан интегральный алгоритм, вероятность обнаружения лжи по нему составляет 93%. Полученные данные о возможных психофизиологических механизмах скрываемых знаний, лжи и обмана обсуждаются в терминах теории функциональной системы и теории векторного кодирования.

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ЦЕЛОСТНЫЙ ПОДХОД К ИЗУЧЕНИЮ РАЗВИТИЯ ДОСЛОВЕСНОЙ КОММУНИКАЦИИ

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В последние два десятилетия наблюдается большое число исследований различных направлений (когнитивного, прагматического, нативистского и др.) в области развития дословесной коммуникации. Это свидетельствует о необходимости использования целостного подхода к анализу дословесной коммуникации. *Целостный* подход предполагает изучение организационной системы как целого, несводимого к сумме его частей; выделение целостных единиц анализа, наиболее адекватных для объяснения свойств целого; выделение целеобразующих факторов и законов развития целого. В наших работах в конце 70-х – начале 80-х годов исследовались: протознаки, языковые функции высказываний в дословесной коммуникации, развитие диалога, влияние речи взрослых на развитие дословесной коммуникации, особенности развития дословесной коммуникации у слышащих и глухих детей, движущие силы развития протоязыка. (Исенина, 1986 и др.). Задачей данного исследования является рассмотрение целостных психологических моделей речи и дословесной коммуникации и их возможностей в исследовании проблем *развития* дословесной коммуникации. При этом полагается, что одной из основных характеристик речи является ее процессуальность. *Целостный подход* связан с понятием *единицы психологического анализа* Л. С. Выготского, которая обладает (в отличие от элементов) неразложимыми далее существенными свойствами, присущими целому, является моделью предмета исследования и представляет существенные связи и параметры объекта. Смысл и значение, синтез интеллекта, аффекта и волевой тенденции, согласно теории Л. С. Выготского, – это образования, включающие элементы как познавательной, так и поведенческой сферы, как эмоционального, так и коммуникативного, как внутреннего, так и внешнего (Выготский, с.357, Морозов, с. 96, 97). Д. МакНейл (McNeil, 2005), используя понятие «единицы анализа» Л. С. Выготского, рассматривает природу жестов, появляющихся совместно со словесной речью. Единица анализа (ЕА) – точка роста жестов, минимальная единица диалектического изменения, обладающая самоорганизующейся силой. Механизм этого

динамического процесса роста – *диалектика образа и языка*. ЕА содержит два противоположных семиотических вида значения: мгновенный глобальный целостный образ (жест) и имеющий временную последовательность, организацию частей и иерархию – язык (McNeil, с.18). Согласно модели Хайдеггера, МакНейл считает, что *коммуникация* – не обмен сигналами, а следствие «социального резонанса и «проживания в доме бытия» (McNeil, с.19). Одной из важных составляющих модели является **контекст**. В дискурсе он формализован как поле противоположностей в пространстве тематических единиц дискурса. Рассматривая развитие жестов у детей, МакНейл приходит к выводу, что ЕА не должна использоваться при анализе жестов детей до 3–4 лет. До этого возраста слова не являются знаками, отсутствуют семиотические отношения между означаемым и означающим. Действительно, полноценные семиотические отношения между означаемым и означающим в слове появляются гораздо позже, однако процесс *развития* дословесных средств коммуникации начинается очень рано. Поэтому необходимо обосновать особенности единицы анализа в дословесном периоде. Хотя автор, говоря о динамичности образа жеста, справедливо указывает, что жест определяется контекстом большого дискурса, включая память и **намерения** (McNeil, с.54), не ясна роль эмоционального компонента речи – переживания в единице анализа. В книгах Ю. Джендлина с феноменологической позиции используется понятие смысла, не выражаемого с помощью символов. Это непосредственно ощущаемый допонятийный смысл. Модель процесса Ю. Джендлина – это контекстно-процессуальная генетическая целостная модель речи (Gendlin, электрон. ресурс, 2001). Джендлин прослеживает функционирование непосредственно ощущаемых невербализованных смыслов в речи, мышлении, наблюдении, в работе памяти, понимания и действия. Восполняя пробел между физиологией и психологией, Джендлин включает телесную ситуацию и поведение в одну парадигму. С новых методологических позиций рассматривается сознание, восприятие, чувства, тело, время, окружение, имплицитность, механизмы и процессы коммуникации, начиная с коммуникации животных, жестового языка и далее – символической словесной коммуникации. Язык понимается как система *культурно* структурированных ситуаций,

контекстов взаимодействия (что делают и что говорят). Ситуация сама внутренне построена как система взаимосвязанных возможных действий и их последствий. Опираясь на результаты исследований когнитивного развития в детстве, индивидуальные чувственные смыслы, рассматриваемые Джендлином, конечно, присущи детям младенческого и раннего возраста. Однако возникает вопрос, каким образом они принимают участие в процессе коммуникации, становятся культурными смыслами, при каких условиях они развиваются и способствуют развитию речи, учитывая, что ребенок с рождения беспомощен.

Ответы на вопросы о развитии символической коммуникации у младенцев и детей раннего возраста можно найти в исследованиях *К. Тревартена* (Trevvarthen, 1989, см. также T. Striano, Ph. Rochat, M. Tomasello и др.), которые в своей основе (соответствуя идеям Выготского о социальной природе развития речи) перекликаются с идеями развития общения и речи в работах М.И. Лисиной. К. Тревартен полемизирует со сторонниками теории однозначной зависимости развития первоначальной символизации у детей от развития интеллекта. Именно в intersubъектном взаимодействии (а не в голове) вырастают такие процессы, как решение проблем, запоминание каузальных отношений, планирование стратегий действий. Именно во взаимодействии имеется естественная мотивация для

intersubъектных отношений и обмена мыслями друг с другом. Используя феноменологический метод исследования отношений между матерью и ребенком, Тревартен рассматривает этапы развития коммуникации, действий младенца, протосимволизации и символизации в безопасных ласковых и игровых отношениях матери и младенца с первых месяцев жизни и до дошкольного возраста в различных культурологических ситуациях. Это дает возможность сделать выводы о единице анализа – минимальной единице диалектического изменения.

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КОНЦЕПТ «ДЕВУШКА» В СОЗНАНИИ ОСЕТИН И РУССКИХ

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В последние годы этнокультурное сознание стало объектом пристального внимания исследователей, что связано с происходящими в мире процессами: с одной стороны, глобализацией, и как следствие этого, активизацией межэтнических контактов, с другой – процессами, им противостоящими, антиглобалистскими, направленными на осознание своей роли в общей мировой культуре и активизацию национального самосознания.

Данными обстоятельствами объясняется интерес исследователей, а также определяется актуальность работ, направленных на изучение этнокультурного сознания.

Сравнительное описание образов этнокультурного сознания посредством объективирующих их языковых средств с использованием ассоциативных методов даёт возможность выявлять совпадающие и несовпадающие фрагменты в структуре и содержании сознания представителей сравниваемых этнокультур.

Целью экспериментального исследования является моделирование содержания и структуры концепта «девушка» как мыслительной единицы в сознании осетин и русских, постоянно проживающих в Республике Северная Осетия-Алания, с языком общения русским.

При построении стратегии исследования мы исходили из гипотезы, в соответствии с которой этнокультурная специфика концепта «девушка» как единицы мышления наиболее ярко должна быть выражена в гендерной парадигме, так как одним из признаков, по которым традиционно отличается одна культура от другой, является то, насколько содержания ролей, которые отводятся в ней мужчине и женщине, различаются между

собой, что, несомненно, оказывает влияние на формирование сознания как мужчин, так и женщин в той или иной культуре. Кроме того, гендерно окрашенные структуры сознания, как было показано в работе В. А. Ефремова (2010), управляют процессами членения действительности и её концептуализации человеком, т.е. собственно мыслительными процессами. Поэтому использование гендерной парадигмы при исследовании концептов как единиц этнокультурного мышления представляется вполне оправданным.

В свободном ассоциативном эксперименте принимали участие 124 испытуемых (ии) женского пола, студенток высших учебных заведений г. Владикавказа. В результате когнитивной интерпретации по методике И. А. Стернина (2007: 33–40) полученного вербального экспериментального материала были смоделированы структура и содержание концепта «девушка» в сознании ии двух экспериментальных групп: осетинок (владеющих осетинским и русским языками) и русских (владеющих только русским языком), а также были описаны категориальная структура и полевая организация исследуемого концепта по группам ии. Сравнительный анализ фрагментов содержания концепта «девушка» в сознании испытуемых двух экспериментальных групп позволил сделать выводы о том, что данный концепт содержит несовпадающие знания об исследуемом фрагменте реальности, стоящим за словом «девушка» в сознании ии в зависимости от национальной принадлежности, что определяет характер функционирования данного концепта как мыслительной единицы в сознании его носителей.

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ИНДИВИДУАЛЬНО-ПСИХОЛОГИЧЕСКИЕ ОСОБЕННОСТИ ОВЛАДЕНИЯ ИНОСТРАННЫМ ЯЗЫКОМ В УСЛОВИЯХ ПРЕБЫВАНИЯ В СТРАНЕ ИЗУЧАЕМОГО ЯЗЫКА

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Основная тенденция современной дифференциальной психологии и психофизиологии

проявляется в интеграции частных, разнородных знаний в единую теорию индивидуальности. Сегодня это область знания, максимально развернутая на запросы практики и потому очень быстро развивающаяся. Как известно, дифференциальная психология имеет области

пересечения с различными другими отраслями психологического знания. В настоящее время дифференциальная психология изучает индивидуальные, предметно-содержательные и духовно-мировоззренческие качества индивидуальности, особенности самосознания, стилевых характеристик личности и осуществления различных видов деятельности (профессиональной, учебной, общения и др.). Важнейшим направлением дифференциальной психологии и психофизиологии в связи с этим является изучение индивидуально-типических особенностей обучаемых в процессе обучения, в том числе обучения иностранному языку.

На фоне повышающихся требований к использованию иностранного языка (ИЯ) до сих пор не решено существующее противоречие между устойчивыми индивидуально-типическими особенностями учащихся в овладении ИЯ и односторонним применением обучающих технологий. В связи с этим возникает необходимость дополнения теоретических построений в области преподавания ИЯ и потребность в использовании новых методов и методик, имеющих более широкие возможности и больший эффект обучающего воздействия.

В 2011 году нами была проведена серия исследований, основной целью которой стало экспериментально-теоретическое изучение закономерностей межполушарной асимметрии мозга и их влияния на индивидуально-типические особенности обучающихся при овладении ИЯ в стране изучаемого языка. Важной целью исследования является также разработка и применение методик, учитывающих индивидуально-типические особенности учащихся, обусловленные межполушарной асимметрией мозга, и активизирующие доминирующий тип овладения ИЯ. Речь идет о выделенных М. К. Кабардовым типах овладения ИЯ – коммуникативно-речевом, когнитивно-лингвистическом и смешанном (Кабардов, 1983).

Психологическое исследование индивидуальных стратегий усвоения ИЯ позволяет существенно углубить характеристику индивидуальных стратегий деятельности и, в конечном итоге, помочь при разработке новых методов обучения. При этом особое внимание уделяется особенностям общения учащихся между собой и с носителями ИЯ.

Исследование проводилось на скомбинированной выборке молодых испытуемых общим количеством 50 человек в возрасте 18–26 лет и осуществлялось на базе курсов немецкого языка при интеграционных центрах г. Кельна (Германия) для русскоговорящих учащихся.

Преобладающий метод обучения – традиционный с элементами коммуникативной методики.

В результате проведенного исследования нам удалось выявить:

1. Особенности зрительной, моторной и слуховой асимметрии учащихся.
2. Особенности усвоения ИЯ учащимися и типы овладения ИЯ:
 - а) уровень достижений учащихся по ряду характеристик владения ИЯ;
 - б) особенности памяти и показатели вербального и невербального интеллекта учащихся с различными типами овладения ИЯ;
 - в) особенности коммуникативного поведения учащихся и восприятия ими иноязычной речи на слух;
 - г) особенности личности обучающихся.
3. Анализ успеваемости обучающихся с различными типами овладения ИЯ при традиционном методе обучения ИЯ.

Кроме того, был проведен формирующий эксперимент с целью повышения эффективности обучения ИЯ, с использованием принципа активизации доминирующей индивидуальной стратегии усвоения ИЯ.

Как показали данный эксперимент и ранее проводимые исследования, существуют достаточно устойчивые индивидуально-типические особенности, проявляемые при обучении ИЯ. Эти особенности, как показывают исследования Кабардова М. К. и Бауэр Е. А., имеют тенденцию сохранения от возраста к возрасту: их наличие обнаруживается уже в младшем школьном возрасте, сохраняясь в подростковом, юношеском и более старшем возрастах (Кабардов, 2006; Смирнова-Бауэр, 2007).

Типы овладения ИЯ являются индивидуальным стилем деятельности. Характеристики межполушарного взаимодействия и латерализация функций, являющиеся важнейшей индивидуально-природной предпосылкой формирования и развития способностей и индивидуализации, имеют фундаментальное значение для изучения вопросов, связанных с мозговыми механизмами речевой деятельности, коммуникацией и логико-грамматическими аспектами языковых способностей. Анализ полушарных функций имеет особое значение при изучении типов овладения ИЯ и разных видов способностей.

Важной особенностью проводимого нами исследования является наличие естественной языковой среды, в которой находятся обучаемые. С одной стороны, данное условие должно оказывать положительное воздействие на скорость и эффективность усвоения ИЯ. Речь идет о непосредственной возможности применять

полученные знания в жизни и совершенствовать их. С другой стороны, наличие языковой среды является некоторым стресс-фактором для обучающихся, которые, по их признанию (55 %) испытывают давление со стороны преподавателей и общества, возлагающих на них определенные ожидания. Как показывают многочисленные тестирования уровня усвоения получаемых знаний, наличие языковой среды не оказывает существенного влияния на успешность овладения ИЯ.

В ходе эксперимента используется разработанная Бауэр Е. А. новая методика преподавания ИЯ, учитывающая три фактора, выделенных Кабардовым М. К.: фактор учителя, фактор ученика и фактор метода (Кабардов, 1999). При разработке данной методики учитывались индивидуально-типические особенности

обучающихся в овладении ИЯ – типы овладения ИЯ – для обеспечения развития доминирующей стратегии усвоения ИЯ.

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«Я ВСЁ УВИДЕЛ». МЕЖПОЛУШАРНОЕ ВЗАИМОДЕЙСТВИЕ В АКТАХ ВОСПРИЯТИЯ

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Экспериментальные исследования в области психологии восприятия и внимания обнаруживают факты, показывающие, что наше восприятие зрительных сцен и происходящих событий является гораздо менее полным, чем нам кажется. Восприятие окружающего мира организуется **смыслом**, который имеют объекты и события для индивида. Преобладающая часть актов восприятия протекает неосознанно, составляя как бы «фоновую поддержку» нашего поведения. Если на дороге появляется камень, через который мы легко перешагиваем, то время его восприятия и принятие решения «больше на камень не смотреть», как правило, не осознаются. Как только смысл камня, как преодолимой преграды на нашем пути, установлен, регулирующий механизм «я здесь все увидел» переводит восприятие и внимание на другие объекты.

Процессы, ограничивающие избыточность «фонового» восприятия, характеризуются последовательностью «от общего к частному» («от глобального к локальному»). Филогенетическая целесообразность глобального зрения (предшествующего сосредоточению на деталях) состоит в том, что подобным образом ситуация оценивается с точки зрения наиболее важных для выживания организма характеристик. Стадо газелей вспугнет и тигр, и приближающийся

автомобиль, вне зависимости от конкретных признаков этих объектов. Кроме того, детальный анализ, выделяющий все новые подробности объекта, может оказаться бесконечным. Необходим механизм, на непроизвольном уровне прерывающий акт восприятия. Превалирование симультанных процессов позволяет оптимизировать восприятие.

Нейрональная организация перечисленных механизмов восприятия является достаточно «жесткой», она не поддается произвольному «отключению». Одним из экспериментов, подтверждающих это положение, является исследование Д. Навона. Он предъявлял испытуемым большие буквы, состоящие из маленьких букв, которые могли совпадать или не совпадать с большими. При настройке на глобальную форму она идентифицировалась без всякой интерференции со стороны букв локального уровня. При настройке на восприятие деталей картина была иной. Ответы были более медленными, а если стимулы оказывались неоднородными, наблюдался эффект интерференции глобального уровня: ответы еще больше замедлялись и становились менее точными. Испытуемые не могли произвольно «отключить» глобальный уровень восприятия (D. Navon, 1977).

Вероятность того, что мы заметим или не заметим те или иные объекты, меняется с изменением их смысла в нашей текущей деятельности. В экспериментах К. Шабри и Д. Саймонса от испытуемого требовалось сосчитать число передач мяча во время игры в баскетбол. Неожиданно

появлявшаяся на площадке горилла не являлась игроком команды. Отсутствие смысловой нагрузки на этот объект приводило к тому, что многие испытуемые не замечали его появления. «Слепота по невниманию» является «платой» за то, что мы можем отсеять детали, мешающие решению основной задачи. Работа мозга не подразумевает расточительного использования ресурсов на осознание всего, что нас окружает (К. Шабри, Д. Саймонс, 2011).

«Ответственность» за «фоновое восприятие», за смысловой уровень переработки информации, за реализацию решений «надо ли смотреть дальше» несет правое полушарие мозга. Симультанное восприятие, которое обеспечивается работой правого полушария, в определенном смысле, **предшествует** произвольному, сукцессивному восприятию, осуществляемому на основе функциональной активности левого полушария. Эти теоретические положения подтверждаются как многочисленными клиническими исследованиями, так и данными, полученными с участием здоровых испытуемых (картирование с использованием функциональной магнитной томографии).

Очаговые поражения мозга искажают те характеристики психических процессов, в осуществлении которых принимали участие пострадавшие структуры. Прерывание нейронных связей приводит к упрощению, укорочению, упрощению специфичных для данного отдела мозга процессов. При поражении правого полушария мозга решение «я всё увидел» приобретает утрированный характер, оно как бы появляется раньше времени. В отделении нейрореабилитации ИНХ нами была обследована группа из 23 больных, у которых в результате очагового поражения правого полушария мозга появилось игнорирование левого пространства (левосторонняя фиксированная агнозия). Поведение больного с левосторонней агнозией не похоже на поведение плохо видящего человека, он не пытается «всмотреться», разобраться, разглядеть объекты. Команда о завершении восприятия «я все увидел» не сопровождается ощущением ошибки. Если перед больным тарелка с едой, он может не увидеть, что на левой части тарелки еще осталась пища. Если попросить его прочитать текст, то начнет читать только правую часть каждой строчки. Однако если обратить внимание больного на то, что он не посмотрел на левую часть своей тарелки, то он увидит пищу. Если для правильного прочтения страницы положить левую руку больного на текст и попросить вести пальцем по строке, притронувшись вначале к собственной

левой руке, можно добиться правильного чтения. На этих приёмах привлечения произвольного внимания больного к его затруднениям мы основывали коррекционное обучение больных с левосторонней агнозией. Больные обучались развернутому, осознанному, **последовательно** сканированию зрительного поля. Снижался удельный вес «пострадавшей» глобальной стратегии восприятия с ее сигналом «я все увидел». За 3–4 коррекционных занятия мы добивались частичного преодоления дефекта – у пациента появлялась возможность самостоятельно справляться с затруднениями в повседневной жизни.

Говоря об игнорировании левого пространства, надо подчеркнуть, что по степени выраженности эта характеристика варьировала, как от одного больного к другому, так и у одного и того же больного на протяжении курса восстановительного обучения. Для объективизации этого процесса мы проводили пробу на зачеркивание точек, расположенных в случайном порядке на листе бумаги. Степень нарушения варьировала от полного игнорирования всех точек, за исключением узкой полосы в правой части листа, до «невнимания» лишь к одной точке в нижнем левом углу.

Распределение внимания в однородном зрительном поле оценивалось при помощи компьютеризированной методики, описанной нами ранее (М. Ю. Каверина, 2008). Было показано, что при прочих равных условиях фокус внимания смещается в сторону, противоположную функционально более активному полушарию. То есть скрытое невнимание к правой части зрительного поля возникает и при поражении **левого** полушария, однако оно никогда не достигает степени игнорирования, т.е. никогда не проявляется в повседневной активности больного. И только поражение **правого** полушария с его неосознаваемыми и почти не поддающимися произвольному подавлению командами на завершение актов восприятия («я все уже увидел») приводят к грубой «слепоте по невниманию» – игнорированию левой части пространства.

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ОТРИЦАТЕЛЬНЫЙ ИНПУТ: ДАННЫЕ РУССКОЙ СПОНТАННОЙ РЕЧИ

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1. Результаты недавних кросс-лингвистических исследований инпута (*child-directed speech*) представили новые аргументы к неутраченной дискуссии о ведущих факторах речевого онтогенеза (Kilani-Schoch et al. 2008, Chouinard, Clark 2003, Saxton et al. 2005). Анализ различных способов реагирования взрослого (*caregiver*) на речевую продукцию ребенка, интерпретируемых как позитивные / негативные свидетельства (*positive / negative evidence*), показывает, что инпут помогает ребенку обнаружить и запомнить правильное / ошибочное. Полученные данные способны существенно ослабить тезис о «лингвистической бедности» обращенной к ребенку речи взрослого, а значит – и о ключевой роли «врожденных языковых структур» (*LAD*) в процессе освоения языка. Предполагается также, что взрослый довольно чувствителен к детским аграмматизмам. Однако остается неизвестным, ошибки каких типов провоцируют отрицательный инпут в большей степени, поскольку практически отсутствуют исследования, выполненные на материале морфологически богатых языков. Кроме того, обнаружение предпочтительных тактик реагирования взрослых – носителей разных языков – ставит вопрос о факторах, обуславливающих качественное своеобразие их «реактивного репертуара» (Kazakovskaya, Balčiūnienė 2011).

В докладе обсуждаются прагматические, коммуникативные и структурные характеристики реплик-реакций русскоязычного взрослого на ошибочные и «неполные» глагольные высказывания ребенка раннего возраста. Результаты сопоставляются с аналогичными данными, полученными при анализе инпута языков, различающихся с точки зрения богатства флективной системы (кросс-лингвистический проект «Pre- and Protomorphology in Language Acquisition», рук. – В. У. Дресслер, Австрийская АН).

2. Материалом исследования послужил корпус расшифрованных и закодированных (CHILDES (В. MacWhinney)) аудиозаписей спонтанных диалогов с ребенком (34 часа, 8,5 тысячи диалогических единств) третьего года жизни: с 2;0 – момента появления первых глагольных форм (*MLU*=1.032) до 2;8 – времени их активного и практически безошибочного употребления (*MLU*=2.603). (Корпус собран

под руководством Н. В. Гагариной.) Единицами анализа явились 1692 пары смежных реплик, включающих высказывание ребенка с глаголом и реакцию на него взрослого.

Используемая прагматическая классификация реплик взрослого основывается на разграничении реакций на формальную (собственно языковую) и содержательную стороны детской реплики, позволяющем выделить металингвистические (*metalinguistic*) и конверсациональные (*conversational*) типы реакций. Помимо этого, реплики были закодированы как вопросительные либо невопросительные повторы, расширения, исправления, реформуляции и кларификации.

Анализ, направленный на выявление корреляции «тип ошибки – тип реакции», учитывал классификации ошибок по а) их соответствию определенной грамматической категории (наклонение, время, возвратность, род, лицо, число) и б) правильному / ошибочному способу образования, употребления либо согласования. Ошибки, связанные с пропуском глагола (смыслового, модального или фазисного), присутствуют в обеих классификациях («неполные высказывания»).

3. Исследование русского корпуса показало, что взрослый в высокой степени «реактивен»: процент игнорированных им реплик ребенка крайне невелик (14% – 12%), а кроме того, реактивные реплики значительно превышают инициативные.

Конверсациональные реакции – как на правильные (*adult-like*), так и на ошибочные реплики ребенка – преобладают (в обоих случаях они составляют 58%); и этом плане русский инпут схож с французским, немецким и литовским. Однако процентное содержание русских металингвистических реакций на правильные высказывания ребенка (30%) значительно превышает результаты, полученные при анализе других корпусов (*лит.* – 16%, *фр.* – 5%, *нем.* – 3%).

Глагольные ошибки ребенка, вопреки распространенному мнению, немногочисленны (12,4%), и с возрастом их количество неуклонно снижается (97% – 4%). Эволюция металингвистических реакций взрослого на них имеет отчетливый «пик»: 62% – 82% в возрасте 2;4–2;6 (Казаковская 2010). Существенно, что дистрибутивные различия детских ошибок по двум классификациям не меняют основного результата в соотношении прагматических реакций взрослого. Взрослый менее толерантен к некорректному образованию, согласованию или

пропуску глаголов, поэтому количество металингвистических реакций незначительно только в сфере глагольного употребления (ошибки в наклонении и морфопрагматике).

Наиболее распространенными структурными типами металингвистических реплик-реакций оказались кларификативные вопросы, которые свидетельствуют о непонимании взрослого и предполагают – со стороны ребенка – более четкий повтор. Доминирующие в сфере конверсациональных реакций вопросы-расширения включают произнесенное ребенком в широкий лексико-грамматический контекст. В этом отношении наши результаты оказались близки к данным, полученным на материале литовского инпута: вопросительные реплики составили более половины всех реплик-реакций в обоих корпусах (рус. – 56%, лит. – 70%), в отличие от немецкого и французского корпусов, где преобладали невопросительные повторы (90%).

4. Итак, есть основания полагать, что русские взрослые в диалоге с ребенком высоко «отзывчивы и реактивны». Их реакции представляют ребенку достаточные позитивные и негативные свидетельства для развития различных компонентов коммуникативной компетенции ребенка: конверсациональные реакции в большей степени существенны для диалогической компетенции, в то время как металингвистические – важны для системно-языковой. Распределение прагматических реакций на ошибочные высказывания зависит от типа ошибки: взрослые более чувствительны к ошибочному образованию глагола и менее – к его контекстному употреблению. Кроме того, они по-разному

реагируют на одинаковые ошибки ребенка, сделанные им в разном возрасте, что подтверждает теорию стадильности реакций взрослого (Chouinard, Clark 2003). Исследование показало также, что взрослые, являющиеся носителями ареально и генетически близких языков, демонстрируют одинаковые коммуникативные стратегии, несмотря на различия, сложившиеся в индивидуальном стиле общения с ребенком. Диспропорция, выявленная в сфере прагматических характеристик реактивных реплик взрослого, может отчасти объяснить дивергенцию в развитии системно-языковой и диалогической компетенций, зафиксированную на ранних этапах речевого онтогенеза (Казаковская 2011).

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ОНТОЛОГИИ: МОСТ МЕЖДУ КОГНИТИВНОЙ ПСИХОЛОГИЕЙ И СПОСОБАМИ ПРЕДСТАВЛЕНИЯ ЗНАНИЙ

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Что объединяет моделирование экспертных знаний и когнитивные психологические методы? Термин «инженерия знаний» (knowledge engineering) введен Э. Шортлиффом, Д. Бучманом и Э. Фейгенбаумом (1979). Ее центральным моментом является извлечение экспертных знаний и их представление в оптимальной модели. Для извлечения знаний используются коммуникативные и когнитивные

методы, с помощью которых инженер по знаниям помогает эксперту вербализовать и формализовать необходимые сведения. Традиционно из широкого ассортимента психологических методов в инженерии знаний применяются различные виды диалогов (от ознакомительного опроса в начале разработки до критического обзора ближе к ее завершению) и групповые методы (от мозгового штурма до заочной Дельфийской методики) (Червинская К. Р. 2002). Когда прямые методы извлечения знаний не дают желаемого результата, используются непрямые методы.

Эти методы основаны на разных формах субъективного шкалирования и служат для реконструкции индивидуальных семантических

пространств. Экспертом в определенной шкале оцениваются смысловые расстояния между элементами знаний (различия и степень сходства между концептами, атрибутами, между элементами знаний разного типа). Построение семантического пространства эксперта – это переход на язык более высокого уровня абстракции, хотя применяемые для этого методы инженерии знаний достаточно просты.

К непрямым методам инженерии знаний относятся различные виды сортировок – по отношению эксперта к концептам в рамках решения определенного круга задач или по взаимоотношениям концептов предметной области между собой с построением иерархической диаграммы кластеров концептов. В результате применения этих методов можно построить концептную карту предметной области, смоделировать потоки данных, жизненный цикл объектов или последовательность действий (построить сети Петри).

Как не прямой способ исследования знаний широко используется матричный подход. Метод матрицы атрибутов заключается в количественной оценке экспертом связи между каждым из набора атрибутов и каждым объектом предметной области. Метод репертуарных матриц (repertory grids) предложен автором теории личностных конструктов Дж. Келли. Целью его применения является выявление персональных конструктов эксперта, т.е. тех признаков или свойств, по которым объекты сходны между собой и, следовательно, отличны от других объектов. Конструкт – некоторая ось, относительно которой располагаются подмножества элементов, количественно связанных с конструктом. При этом объекты связаны определенным контекстом – репертуаром предметной области, а эксперт оценивает каждый объект предметной области по каждому конструкту. Если аналитик изменяет репертуар (набор элементов знаний), то выявляются конструкты разного уровня общности (Франселла Ф., Баннистер Д. 1987).

Перечисленные когнитивные методы направлены на извлечение экспертных знаний, но не менее важным аспектом инженерии знаний является их моделирование. Модели представления знаний имеют психологические корни:

- модель фреймов – иерархически организованная структура, предложенная Марвином Минским (1979);
- сетевая модель имеет аналогом структуру долговременной памяти человека и пригодна для представления знаний любых типов (Quillian, M.R. 1968);

- продукционную модель как способ представления знаний в виде совокупности правил предложил Э. Пост (Уэно Х. 1989).

С последней декады прошлого века активно разрабатывается онтологический подход к моделированию знаний. С одной стороны, онтология – раздел метафизической философии, в котором рассматриваются всеобщие основы, принципы бытия, его структура и закономерности. С другой, онтологией называются представленные на определенном языке знания о предметной области (Клещев А.С. 2008). Онтология – формальная система понятий предметной области, их свойств, отношений между ними и правил операций над ними. Онтологический подход к моделированию предметной области дает возможность разрабатывать информационные системы «верхнего уровня» и обеспечить интероперабельность первичных информационных систем.

В настоящее время развивается парадигма двухуровневых информационных систем (Гусев А.В. с соавт. 2005). В традиционных информационных системах конкретные данные согласованы с объектной моделью предметной области. Примером двухуровневого подхода является стандарт разработки OpenEHR (<http://www.openehr.org/standards/iso.html>). На базовом уровне стандарт OpenEHR включает модель-онтологию, называемую референтной моделью. Она согласована с моделью второго уровня, которая является совокупностью моделей отдельных элементов знаний (медицинских терминов, процессов, явлений). Эти частные модели называются архетипами, соответствуют реальным потребностям медицинского персонала и могут изменяться медицинскими аналитиками. Медицинские данные конкретных пациентов в данном стандарте представляются в соответствии с референтной моделью и архетипами. Такая архитектура значительно уменьшает вариабельность используемых данных в разных информационных системах, позволяет им обмениваться информацией и совмещать электронные записи пациентов.

Невзирая на варианты моделей, объектом моделирования остаются знания, а методической основой их извлечения являются когнитивные и коммуникативные методики. В процедуре «добычи» знаний до сих пор не решены многие проблемы. Так, в настоящее время отсутствуют верифицированные методы извлечения и представления скрытых экспертных знаний, которые являются исключительно важными для поддержки принятия решений и разработки двухуровневых информационных систем.

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РОЛЬ УКАЗЫВАЮЩЕЙ РУКИ ПРИ ОЦЕНКЕ ГЕОМЕТРИЧЕСКОЙ ИЛЛЮЗИИ

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Один из подходов к исследованию сознания – изучение работы сознания на основе анализа природы ошибок, которые оно совершает. Традиционным источником ошибок являются иллюзии размера, в которых равные части некоторых геометрических фигур воспринимаются испытуемыми как неравные. Известно, что сила иллюзий размера зависит от направленности внимания (на изображение в целом или же на его отдельные фрагменты), от модальности предъявления иллюзии (зрительная или тактильная), от модальности, в которой дается ответ испытуемого (вербальная или тактильная). В тактильной модальности сила иллюзии также зависит от того, видит ли испытуемый руку, которой совершает указывающие движения (Bruno N., Bernardis P., Gentilucci M. 2008; Carey D, 2001). В целом, в тактильной модальности сила иллюзии меньше, чем в зрительной модальности (Milner A. D., Goodale M.A., 1995; Proffitt D. R., Creem S.H., 1999). Одно из объяснений этого может заключаться в существовании двух подсистем восприятия – восприятие для действия и восприятие для познания. Подсистема восприятия для действия направлена на до-объектную оценку характеристик пространства и, по видимому, находится поэтому под меньшим контролем сознания. Таким образом, снижение сознательного контроля ведет к правильному решению задачи. Похожая интерпретация результатов при решении других когнитивных задач существует в (Морошкина Н.В., 2006).

Будет ли зависеть сила иллюзии от руки, которой испытуемый совершает движения?

В наших опытах испытуемым на экране монитора предъявляли иллюзии Мюллера-Лайера,

трапеции и Понзо с различным размером объектов (70, 100 и 150 мм), а также контрольные пробы. Испытуемые должны были отметить размер предъявляемых объектов на сенсорном экране. В опытах участвовало 2 группы испытуемых: правшей, в каждой группе по 16 испытуемых. Одна группа (группа А) видела руку, которой совершались указывающие движения, другая (группа В) – не видела руки. Каждая группа была разбита на 2 подгруппы. Испытуемые одной подгруппы (подгруппа R) сначала осуществляли все пробы правой рукой, а затем левой рукой. Испытуемые другой подгруппы (подгруппа L) сначала осуществляли все пробы левой рукой, а затем правой рукой.

Оценивали различие в силе иллюзии размера между правой и левой руками испытуемых каждой подгруппы. Показано, что для испытуемых подгруппы BL сила иллюзии достоверно меньше для указывающих движений левой руки, для испытуемых подгруппы BR существует тенденция той же направленности. Для группы А отличий в силе иллюзии размера между левой и правой рукой не обнаружено (см. табл. 1).

Подгруппа	AL	AR	BL	BR
Различие в силе иллюзии, мм	3.5	4	-5.6	-6*

Таблица 1. Различие в средней силе иллюзии между левой и правой рукой.

Мы предполагаем, что подобный эффект связан со степенью вовлеченности правого и левого полушария в процесс оценки длины линий. Сила иллюзии оказывается меньше для левой руки, движениями которой управляет не только левое, но и правое полушарие. По всей вероятности, когда испытуемые сначала осуществляют движения левой рукой, доминирует правополушарная метрическая система репрезентации, что приводит к более точной оценке длины линии

(Grafton S. T., Hazeltine E., Ivry R. B., 2002). В управление движениями правой руки вовлечено левое полушарие (Jager G., Postma A., 2003). Вероятно, в данном случае преобладает категориальная пространственная система внутренних репрезентаций, лишенная точной метрики. В то же время отнесение предъявленных стимулов к некоторой категории предполагает включение сознания в данный процесс. Тогда, когда испытуемые видят свою руку, процесс оценки размера идет под большим контролем сознания и, следовательно, при большем участии левого полушария – и в этом случае различия в силе иллюзии между левой и правой рукой не наблюдается. Полученные результаты отчасти согласуются с данными, полученными нами ранее в вертикальной плоскости – указывающие движения левой руки испытуемых по иллюзии Мюллера-Лайера были точнее, чем указывающие движения правой руки испытуемых.

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ОБ ОДНОЙ ТИПОЛОГИЧЕСКИ УНИКАЛЬНОЙ МЕТАФТОНИМИИ

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(Нальчик)

Данное сообщение представляет собой часть исследования, посвященного изучению соматизмов кабардино-черкесского (=кабардинского) языка и связано с рассмотрением нового явления в когнитивной семантике, которое с легкой руки Луи Гуссенса (Goossens 1990) получило название «**метафтонимия**» – родовой термин (cover term), введенный для общего обозначения двух моделей взаимодействия метафоры и метонимии. Так, анализируя, конвенционализированные выражения (conventionalized expressions), которые в качестве одного из компонентов включают «представителя» одной из трех донорских областей: (1) *части тела*, (2) *звуки* (3) *ожесточенные действия* (violent actions), Л. Гуссенс пришел к выводу о том, что каждый из них может перейти в целевую область, названную им «речевые действия» (linguistic actions), что предопределяется возможным одновременным или последовательным «прочтением» одной и той же фразы в терминах метафоры или метонимии. Ср. примеры to bite off one's **tongue** в значении to make oneself unable **to speak** (1); to giggle в значении express by or **utter** with a giggle (2) и snap at в значении **say** or answer in an angry

or rude way (3). Использование трех донорских областей для концептуализации указанной ресурсной зоны, как оказалось, опирается на два доминирующих типа: *метафора из метонимии* и *метонимия в метафоре*. Что же касается такой разновидности, как *метонимия из метафоры*, автору не удалось обнаружить ее в анализируемом материале, хотя, по его мнению, такое в принципе возможно (though not impossible in principle) [Goossens 2002: 349–379]. В данном сообщении нас интересует именно этот тип, который не удалось обнаружить Л. Гуссенсу: viz. **метонимия, порождаемая метафорой**.

Так, анализируя семантику частотных существительных английского языка в нашем более раннем исследовании (Кимов 1982), выполненном в духе традиционного (логического) подхода в широком смысле), мы обнаружили, что названия времен года с регулярностью используются в целях метафорической номинации (*весна любви нашей*, ср. англ. the autumn of our love). Кроме этого, все существительные «темпорального» ряда: минута, день, ночь, неделя, год и т. д.), как оказалось, способны к метонимическому расширению сферы референции, которое укладывается в формулу ВРЕМЯ → событие (ср. *Это было ужасное утро*). Данная формула носит характер лингвистической универсалии, ввиду того, что метонимия в отличие от метафоры является «отражением регулярных связей

в объективном мире» (ср. *Le terrible hiver russe est le principal ennemi de l'armée napoléonienne*).

Вместе с тем, подходу с когнитивных позиций к описанию кабардинского языка (Кимов 2006) и экстраполируя выводы, полученные нами ранее в другой парадигме знания, мы выявили типологически уникальную особенность вторичного знакообразования, т.е. типологически уникальную метафтонимию. В кабардинском языке сосуществуют две конкурирующие модели восприятия мира – антропоморфная и зооморфная. При этом именно сквозь призму зооморфной модели осуществляется концептуализация времени. Так, начало и конец протяженных вытянутых объектов (палка, веревка) в кабардинском языке обозначаются при помощи двух соматизмов, используемых в своих метафорических значениях (*пэ нос* символизирует начало, а *кІэ хвост* – конец). Эти же самые соматизмы служат в этом языке для метафорического обозначения начала и конца временных отрезков. Отсюда при буквальном переводе на русский язык мы имеем *нос* и *хвост утра/недели, зимы/осени/года* и т.д.). Других **обозначений начала и конца временного отрезка язык просто не имеет!** Эти же самые **метафорические имена** (*пэ нос* и *кІэ хвост*) используются в кабардинском языке в **метонимических целях**,

чем и обусловлено функционирование большого количества вполне нормативных примеров (ср. *«нос года/осени/недели» был для нас несчастливым, посмотрим, что нам принесет «хвост года/осени/недели»*; ср. также: *«нос фильма/романа мне не понравился, хвост фильма/романа намного интереснее»*).

Не вызывает сомнения то, что в данных и им подобных многих примерах мы имеем дело с особым случаем метафтонимии (метонимии из метафоры), явлением, которое вызвано к жизни сложной концептуальной цепочкой (пространственная метафора создает экспериенциальную базу для временной метафоры, которая в свою очередь закладывает когнитивные основания для конечного «продукта» – метонимии), укладываемой в формулу ВРЕМЯ > СОБЫТИЕ.

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О ВЗАИМОСВЯЗИ МЕНТАЛЬНОСТИ И ИНСТИТУЦИОНАЛЬНОСТИ

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Аргументируется взаимосвязь складывающихся в обществе институциональных макроструктур и доминирующих социальных представлений (ментальных моделей). Институты формируются в результате действий социальных субъектов и представляют собой легитимизированные образцы социальных практик, что означает наличие двусторонней связи между институтами как структурами общества и индивидами как носителями ментальных моделей. Предполагается, что взаимосвязь между типами ментальности и институтами имеет морфологический характер. Это означает, что они являются отражениями одного целого, и в качестве этого целого выступает социальная деятельность в определенных материальных условиях, формирующая общество. И типы ментальности, и системы общественных

институтов в совокупности реализуют закрепившиеся в истории (проверенные историей) пути осознания и достижения коллективных целей, стоящих перед сообществами людей – нациями и государствами. Гипотеза базируется на сопоставлении достижений теории институциональных матриц (Кирдина, 2000, 2001; 2005; Институциональных матриц теория, 2010) и результатов типологизации ментальных моделей, полученных в ходе психологических исследований (см. в Александров, Александрова, 2009, 2010).

Показано, что в обществах с доминированием институтов Х-матрицы (к которым относится Россия) более распространены «незападные» ментальные модели, в то время как в странах с доминированием институтов Y-матрицы – «западные» модели.

Работа выполнена при поддержке грантов РФФИ (проект № 11–06–12035–офи-м-2011) и РГНФ (проект № 11–02–00088а), а также Совета по грантам Президента РФ для поддержки ведущих научных школ РФ (проект № НШ-3752.2010.6).

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СООТНОШЕНИЕ ВРЕМЕНИ РЕАКЦИИ И ДЛИТЕЛЬНОСТИ НАЖАТИЯ ПРИ ВЫПОЛНЕНИИ ПРОСТЫХ И СЛОЖНЫХ СЕНСОМОТОРНЫХ РЕАКЦИЙ

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Большое количество работ посвящено изучению влияния функционального состояния, физических характеристик стимулов, межстимульного интервала, количества альтернатив, а также других особенностей протекания психологических процессов на показатель времени реакции (ВР) (Смирнов и др. 1983, Ратанова, Чуприкова, 1995, Айдаркин, 2007). Однако двигательная реакция представляет собой длительный процесс (150–300 мс) и состоит из этапов нажатия, удержания и отжатия кнопки (Айдаркин, Айдаркина, 2007). В нашем предыдущем исследовании (Айдаркин, Кирпач, 2011) было показано, что длительность удержания (ДУ) зависит от номера тренировки и от места нажатия в двигательном стереотипе. Малоизученным остается взаимоотношение ВР и ДУ при выполнении простых и сложных сенсомоторных реакций.

Исследования проводились на 23 испытуемых (студенты и сотрудники Южного федерального университета в возрасте 20–30 лет). Обследование состояло из следующих тестовых процедур:

1. *Произвольные нажатия левой и правой рукой* – испытуемые выполняли нажатия на кнопку датчика левой или правой рукой с интервалом около 2 с, который они отмеривали произвольно. Для каждой руки выполнялся отдельный тест.

2. *Простая СМР на звуковой или зрительный стимул* – испытуемым предъявлялись щелчки интенсивностью 80 Дб или вспышки интенсивностью 9 Кд с межстимульным интервалом 2 с. В ответ на стимул требовалось как можно быстрее выполнить двигательную

реакцию правой рукой. Для каждой модальности выполнялся отдельный тест.

3. *Сложная СМР или реакция выбора* – испытуемым предъявлялись щелчки и вспышки с вероятностью 0,5 и межстимульным интервалом 2 с. Испытуемый как можно быстрее выполнял двигательную реакцию правой рукой на зрительный стимул и левой рукой на слуховой стимул.

Регистрация ЭЭГ и времени реакции (ВР) и длительности удержания (ДУ) каждой кнопки осуществлялись при помощи компьютерного энцефалографа-анализатора «Энцефалан – РЭГ-131–03» («Медиком – ЛТД», г. Таганрог). При этом регистрировалась ЭЭГ-активность головного мозга в 21 стандартном отведении (система 10–20) с шагом дискретизации 4 мс и частотой пропускания 0,5–70 Гц. Оцифрованная ЭЭГ экспортировалась в MATLAB, где вычислялись ВР, ДУ и связанные с событиями потенциалы (ССП).

Были выявлены достоверные различия ДУ для правой и левой рук ($197,6 \pm 0,0014$ мс и $220 \pm 0,0014$ мс, соответственно) при произвольных движениях. Анализ гистограмм распределения показал, что при нажатиях правой рукой существовало большее число «коротких» нажатий (длительностью 120–150 мс), чем при нажатиях левой рукой. Анализ моторных СПП, ранжированных по ДУ, показал, что при увеличении ДУ наблюдается разделение моторных компонентов, связанных с нажатием и отжатием кнопки (Айдаркин, Айдаркина, 2007). При коротких нажатиях доминирует компонент mN1, связанный с нажатием, при увеличении ДУ начинают выделяться оба моторных компонента, что, вероятно, связано с выделением отжатия в качестве отдельного моторного события.

Дисперсионный анализ ДУ при выполнении СМР на зрительный и слуховой стимулы выявил

достоверное влияние факторов модальности и сложности задания. Средние значения ДУ составили 188,8 мс при простой аудио-моторной реакции и 175,7 мс при простой зрительно-моторной реакции. В условиях сложной СМР ДУ составила 191,4 мс при выполнении реакции на звуковой стимул и 182,4 мс при выполнении реакции на зрительный стимул. Анализ сенсорных ССП в зависимости от ДУ показал, что при коротких ДУ моторные компоненты на нажатие и отжатие суперпозировались с компонентами N2 и P3 сенсорного ССП. При больших значениях ДУ компоненты, связанные с нажатием, не изменялись, в то время как компоненты отжатия выделялись в виде самостоятельных колебаний после сенсорных. Анализ соотношения ДУ и ВР при выполнении простой СМР на звуковые и зрительные стимулы показал, что при значениях ДУ от 50 до 300 мс увеличение ДУ сопровождалось увеличением ВР. При значениях ДУ более 300 мс ВР снижалось.

В современных исследованиях (Desmurget, 2009) показано, что моторное внимание работает на всех этапах реализации движения и включает сознательное желание выполнить движение (motor intention), субъективное ощущение, что действие уже началось (motor awareness), объективную информацию о начале движения (veridical awareness). При выполнении коротких движений моторное внимание активируется в основном на этапе программирования (intention) движения. При увеличении длительности запускаются дополнительные

механизмы контроля и коррекции движения за счет комбинации афферентной (проприоцептивной, зрительной) и эфферентной информации на сознательном уровне (motor awareness, veridical awareness). Таким образом, двигательная реакция представляет собой длительный процесс, включающий несколько событий (нажатие, удержание и отжатие кнопки). При коротких значениях ДУ внимание активируется лишь на этапе запуска движения. Удержание и отжатие являются автоматическими и программируются до начала движения. Увеличение ДУ приводит к тому, что отжатие становится самостоятельным процессом, вызывающим активацию внимания.

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МНОГОМЕРНЫЙ АНАЛИЗ ЦВЕТО-ЭМОЦИОНАЛЬНЫХ СЕМАНТИЧЕСКИХ СВЯЗЕЙ (ОБЩИЙ И КРОССКУЛЬТУРНЫЙ АСПЕКТЫ)

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Введение. Задача изучения взаимосвязи цвета и эмоций является одной из актуальных и современных для психологии и когнитивных нейронаук. Решение этой задачи имеет важное как теоретическое, так и практическое значение для психотерапии, психодиагностики и эргономики. Начиная с 70-х годов XX века, в психофизиологической школе академика Е. Н. Соколова была изучена многомерная структура цветового и эмоционального пространств, построенных на основании оценок различий как

между перцептивными (Измайлов, Соколов, Черноризов, 1989; Измайлов, 1995, 1999), так и между семантическими (Вартанов, Соколов, 1995) стимулами. Однако до сих пор нерешенным остается вопрос о возможности построить объединенное цвето-эмоциональное пространство на базе единой шкалы субъективных различий, потенциально выявляющей интегральные цвето-эмоциональные основания категоризации. Кроме того, отдельный исследовательский интерес представляет изучение стабильности этого пространства в западной и восточной культурах.

Цель. Проанализировать структуру общего цвето-эмоционального семантического пространства с единой метрикой субъективной

различий у русских испытуемых, а также из-за отличия у китайских испытуемых.

Методы. В качестве стимульного материала были использованы названия 7 базовых эмоций (счастье, удивление, страх, печаль, отвращение, гнев, спокойствие) и 10 базовых цветов (синий, голубой, зеленый, салатовый, желтый, оранжевый, красный, пурпурный, фиолетовый, белый) – всего 17 названий, образующих однородную стимульную базу (на русском языке – для русских испытуемых, на китайском языке, иероглифами – для китайских испытуемых). Объединение стимулов-названий цветов и стимулов-названий эмоций в один набор позволило использовать единую субъективную метрику в интегральном цвето-эмоциональном семантическом пространстве. Названия предъявлялись в виде слов, написанных белым шрифтом на черных слайдах. Стимулы предъявлялись последовательно друг за другом с помощью программы VectScal (автор С. А. Кисельников), так, чтобы в одной экспериментальной серии были предъявлены все возможные парные сочетания из матрицы 17*17. От испытуемого требовалось дать оценку различий между значением наличного и предыдущего стимула с использованием шкалы от 1 (максимальное сходство) до 9 (максимальное различие). Каждый испытуемый проходил одну пробную и 5 экспериментальных серий (всего 1360 сравнений). В экспериментах приняло участие 9 русских и 8 китайских испытуемых (студенты, соответственно, российских и китайских вузов), выборки были уравнены по полу и возрасту. По каждому испытуемому была получена усредненная по 5 прохождениям матрица 17*17, после чего индивидуальные матрицы всех испытуемых были усреднены в общую матрицу (отдельно для русских и китайских испытуемых), которая была обработана методом неметрического многомерного шкалирования. Для кросскультурного анализа также вычислялись непараметрические корреляции между русскими и китайскими испытуемыми по общим матрицам 17*17 и отдельно по подматрицам цвет-цвет, эмоция-эмоция и цвет-эмоция.

Результаты. 1. *Русские испытуемые.* В эмоциональном подпространстве были выделены 3 оси (активности, знака и силы), в цветовом подпространстве были выделены также 3 оси (2 оппонентные хроматические – зелено-красная и сине-желтая – и ахроматическая). При анализе кривой стресса неметрической модели объединенного цвето-эмоционального пространства было получено, что в случае двумерного решения кривая стресса резко перегибается, после чего выходит на плато. В связи с этим было

проанализировано двумерное решение для общей матрицы 17*17. Анализ взаиморасположения стимулов в полученной плоскости выявил интегральное цвето-эмоциональное пространство, в котором одновременно прослеживается и хроматическая ортогональность зелено-красной и желто-синей оппонентных систем, и эмоциональная ортогональность знаковой системы и объединенной системы «активность-сила», причем эмоциональная и цветовая системы имеют единый центр. Полюс «спокойствие» объединенной системы «активность-сила» объединился в один пространственный кластер с зеленым (а также салатовым) цветом, в то время как оппонентный полюс «гнев-страх» этой системы объединился с красным (а также пурпурным) цветами. Таким образом, эмоциональная ось «спокойствие vs. страх-гнев» близко совпала с хроматической осью «зеленый vs. красный». Полюс «счастье» объединенной системы «знак» объединился в один пространственный кластер с желтым цветом, в то время как оппонентный полюс «печаль» этой системы объединился с синим (а также голубым) цветами. Таким образом, эмоциональная ось «счастье vs. печаль» близко совпала с хроматической осью «желтый vs. синий». Промежуточное значение по осям «активность-сила» и «знак» заняли комплекс «удивление-оранжевый» и «отвращение-фиолетовый», в то время как белый цвет занял место в области пересечения полученных цвето-эмоциональных интегральных осей.

2. *Кросскультурный анализ.* При вычислении корреляции между усредненными матрицами русских и китайских испытуемых было получено, что корреляция между общими матрицами 17*17 составляет 0.74 ($p < 0.01$). Таким образом, русские и китайские испытуемые дают достаточно сходные оценки субъективных расстояний между стимулами в интегральном цвето-эмоциональном пространстве. Для исследования структуры этой корреляции были вычислены коэффициенты корреляции отдельно между цвето-цветовой, эмоционально-эмоциональной и цвето-эмоциональной подматрицами общей матрицы. Оказалось, что однородные цвето-цветовые семантические связи коррелируют на уровне 0.83 ($p < 0.01$), однородные эмоционально-эмоциональные семантические связи – на уровне 0.84 ($p < 0.01$), в то время как гетерогенные цвето-эмоциональные семантические связи – на уровне 0.61 ($p < 0.01$). Видно, что в структуру общей корреляции по матрице 17*17 больший вклад вносят корреляции между однородными связями и меньший вклад – корреляции между гетерогенными связями.

Вместе с тем межкультурная корреляция даже по гетерогенным цвето-эмоциональным связям достаточно велика и значима, что доказывает большую кросскультурную общность цвето-эмоциональных семантических связей, даже взятых отдельно от еще более унифицирующего контекста цвето-цветовых и эмоционально-эмоциональных семантических связей. Далее была исследована причина снижения цвето-эмоциональных кросскультурных корреляций, для чего все клеточки подматрицы цвет-эмоции были проранжированы по модулю разницы соответствующих русских и китайских оценок. Первые два значения оказались значительно больше других: а) разница расстояний между семантическими объектами «красный» и «счастье» у русских и китайцев и русских достигает 3.02 баллов, т.е. красный цвет для китайцев более

«счастливым», чем для русских, б) белый цвет у китайцев более «печальный», чем у русских (на 2.83 балла). Это может отражать влияние различий в цвете праздничной и траурной одежды и многих других культурных факторов, отличающих российскую и китайскую ментальности.

Выводы. 1. На глубинном уровне цветовой и эмоциональной семантики существует интегральное пространство, цветовые и эмоциональные оси которого близко совпадают, что дает возможность говорить о существовании единых цвето-эмоциональных оснований категоризации. 2. Матрицы субъективных различий в интегральной цвето-эмоциональной семантической системе у русских и китайских испытуемых хорошо коррелируют, причём максимальные отличия наблюдаются в связях «красный» – «счастье» и «белый» – «печаль».

ВЕКТОРНАЯ ПСИХОФИЗИОЛОГИЧЕСКАЯ МОДЕЛЬ РАЗЛИЧЕНИЯ ПРОСТЫХ ЗРИТЕЛЬНЫХ ПРИЗНАКОВ (ЯРКОСТЬ, ЛИНЕЙНЫЙ РАЗМЕР)

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Введение. Одной из глобальных математических моделей функционирования психического, комплексно описывающей сенсорные, когнитивные и исполнительные процессы, является векторная психофизиологическая модель, созданная в 70-х годах XX века в России академиком Е. Н. Соколовым и его учеником Ч. А. Измайловым (Измайлов, Соколов, Черноризов, 1989; Измайлов, Черноризов, 2005; Соколов, 2008). Сутью модели является сферический принцип кодирования информации, предполагающей нормировку модулей сенсорных и исполнительных векторов возбуждения в нейронных сетях, в результате чего стимулы представляются точками на поверхности n -мерной сферы постоянного радиуса. Методически модель проверяется с помощью изучения процесса различения стимулов и использования математического аппарата многомерного шкалирования. В данной работе в русле традиций психофизиологической школы Е. Н. Соколова был использован комплексный подход к регистрации межстимульных различий, предполагающий использование классических субъективных балловых оценок и запись

зрительных вызванных потенциалов (ВП) и времени реакции (ВР) по предложенной нами оригинальной методике. Выбор в качестве объекта исследования таких элементарных одномерных признаков, как яркость и линейный размер, был обусловлен тем, что векторная модель предсказывает многомерный и, более того, сопряженный по сферическому закону характер лежащих за восприятием этих признаков ортогональных нейронных каналов.

Цель. Изучить процессы различения яркости и линейного размера человеком на психофизическом и психофизиологическом уровнях; комплексно верифицировать классическую сферическую модель различения яркости, а также построить новую оригинальную модель различения линейного размера (длины линий).

Методика. А. Яркость. Эксперимент на различение яркости включал три этапа: психофизический этап регистрации субъективных оценок, этап регистрации времени простой сенсомоторной реакции на замену и этап записи ВП на замену, которые соответствовали разным уровням когнитивной обработки. В качестве стимуляции использовались 9 гомогенных ахроматических паттернов различной яркости, которые предъявлялись на весь экран профессионального 22» монитора Iiyama. Яркость стимулов была подобрана так, чтобы логарифмические расстояния между ними по фотометрической шкале яркости были одинаковы (от 1 до 80 кд/м²). Регистрация

ЭЭГ осуществлялась монополярно от 16 отведений по международной системе 10–20% на электроэнцефалографе Nihon Kohden. **1.** На этапе субъективных оценок испытуемый с использованием шкалы от 0 (максимальное сходство) до 9 (максимальное различие) давал балловую оценку различия стимулов, предъявлявшихся друг за другом на экране монитора, для каждого испытуемого было записано 15 предъявлений каждой клеточки матрицы 9×9 . **2.** На этапе записи ВР испытуемый как можно быстрее нажимал кнопку регистратора в ответ на «мгновенную» (менее 5 мс) смену стимулов яркости, для каждого испытуемого было записано 100 предъявлений каждой клеточки матрицы 9×9 . Время такой реакции интерпретировалось как мера близости стимулов. **3.** На этапе регистрации ВП испытуемому предъявлялись «мгновенно» заменяющиеся один на другой стимулы длительностью каждый 1000 мс. В ВП на замену регистрировались 200-мс фон и 600-мс запись. Для каждого испытуемого было записано 60 предъявлений каждой замены (по каждой клеточке матрицы 9×9), которые были усреднены после очистки ЭЭГ от артефактов. Эксперименты по яркости прошли 13 человек, студенты факультета психологии. **Б. Линейный размер.** Эксперимент на различение линейного размера включал психофизическую регистрацию субъективных оценок. В качестве стимуляции использовались 15 вертикальных центрированных черных линий разной длины и одинаковой толщины (длина от 2 до 716 пикселей с константным шагом 50 пикселей, толщина 2 пикселя, экран ноутбука 12», разрешение 1280x800). Стимулы предъявлялись парами на белом фоне на экране ноутбука, так, что левая линия-стимул была расположена по центру левой половины экрана, а правая линия-стимул – по центру правой половины экрана. От испытуемого требовалось дать оценку различий между левым и правым стимулом (от 0 до 9), для каждого испытуемого было записано 5 предъявлений каждой клеточки матрицы 9×9 . Эксперименты по линейному размеру прошли 5 человек (студенты факультета психологии).

Обработка данных. 1. Полученные в психофизических сериях усредненные матрицы различий обрабатывались с помощью процедуры многомерного шкалирования и полученные конфигурации тестировались на сферичность (субъективные оценки рассматривались как меры разности стимулов [эксп. А и Б], время реакции – как мера близости стимулов [эксп. А]). **2.** В результате записи ЭЭГ [эксп. А] были получены 72 усредненных ВП (количество пар

в полной матрице различий = $9 \times (9-1)$). В затылочных отведениях О1 и О2 были вычислены и обработаны многомерным шкалированием амплитуды классических компонентов «ВП различения» N87 и P120 (Paulus, 1984).

Результаты. А. 1. Многомерный анализ субъективных матриц балловых оценок дает классическую полуокружность в двумерном пространстве, оси которого репрезентируют В-/Вl- и D-нейронные каналы восприятия яркости. **2.** Многомерный анализ матриц простого сенсомоторного времени реакции как меры близости стимулов дает сложную трехмерную траекторию, которую можно представить как параллельную суперпозицию сферического механизма (синусовая и косинусовая оси, т.е. В-/Вl- и D-каналы, причем стимулы описывают более чем 180° траекторию) и линейного механизма (ось интенсивности). Математически аппроксимировать такую траекторию можно винтовой линией в трехмерном евклидовом пространстве. **3.** На уровне компонентов ВП было получено, что наилучшее решение задачи многомерного шкалирования получается для амплитуды компонента P120 в отведении О2, причем стимулы образуют сложную трехмерную траекторию, похожую на проанализированный выше случай с ВР. Таким образом, при переходе от неосознаваемых индикаторов разности (ВР, ВП) к осознаваемым (балловые оценки) происходит редукция линейного механизма и сужение диапазона вращения радиус-вектора по сфере до 180° . **Б.** Многомерный анализ субъективных матриц балловых оценок дает, как и предсказывает сферическая модель, строгую полуокружность в двумерном пространстве. Оси этого пространства могут репрезентировать работу ортогональных каналов-предетекторов, причем один канал является оппонентным (аналог В-/Вl-нейронов в яркости), а второй – неоппонентным (аналог D-нейронов в яркости). Возможно, оппонентная структура одного из выявленных каналов связана с эффектом контраста размера (наблюдается при разнесённости стимулов, см. Jordan, English, 1989) – аналогично яркостному контрасту. В предлагаемой модели также учитывается адаптация каналов (нейронов-предетекторов) под средний текущий уровень стимуляции и ее размах, что дает объяснение факта занятия стимулами всей полуокружности, а не только части дуги. Отметим, что предложенная модель не противоречит данным Стивенса о линейном восприятии длины линии (Stevens, 1975), ибо в сферической модели испытуемые при оценивании абсолютной длины линии «идут» по дуге

перцептивной сферы, а при оценивании разницы между длинами линий – по хорде, стягивающей точки на дуге (Соколов, Вайткявичус, 1989; Соколов, 2008).

Вывод. Предлагаемый подход к изучению психофизиологических механизмов восприятия

простых перцептивных признаков, основанный на комплексной регистрации вызванных потенциалов, времени реакции и субъективных балловых оценок, позволяет уточнять и развивать сферическую модель Соколова-Измайлова.

СОВРЕМЕННАЯ ЛОГИКА В КОНТЕКСТЕ КОГНИТИВНЫХ ИССЛЕДОВАНИЙ

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(Екатеринбург)

Логика является одной из самых древних наук, а междисциплинарные исследования познавательных процессов когнитивной наукой характерны для наших дней, и взаимоотношения между этими областями знания настолько непросты, что в их характеристике обычными становятся слова «разочарование логикой». Традиционно человеческая способность к познанию, а точнее – к научному познанию, рассматривалась в качестве образца зрелой, сформированной интеллектуальности, изучалась в рамках гуманитарного знания (прежде всего, в рамках философии – эпистемологии), а *канонам* научного познания считалась традиционная формальная (классическая) логика, вполне сложившаяся уже в IV в. до н.э. Когнитивные исследования существенно сместили акцент рассмотрения в сторону интеллекта зарождающегося, его становящейся способности к познанию (что особенно характерно для когнитивной психологии, напр., Крайг и Бокум 2006). Традиционная логика оказалась слишком абстрактным построением с излишне ригористичными семантическими обязательствами, а значит, и слабо применимой к областям изучения и моделирования реальной (естественной) интеллектуальной деятельности.

Однако на IX Международном конгрессе по логике, методологии и философии науки (Упсала, Швеция), прошлый век был назван «золотым веком Логики» (Вригт 1992: 80). Употребление столь лестного эпитета может быть объяснено целым рядом причин, но две из них, пожалуй, самые главные: во-первых, *математизация логики*, и кажется, что «такого предательства» никак не могут простить в широкой гуманитарной среде; во-вторых, *деуниверсализация классической логики* и появление множества неклассических логических

систем, актуальное научное событие, культурно-философское осмысление которого пока не сложилось. И если математизация логики решающим образом повлияла на появление информационных технологий и, как следствие, такой когнитивной проблематики, как ИИ, то деуниверсализация логики все еще остается *terra incognita* для многих специалистов по изучению интеллекта.

Логический плюрализм составляют следующие направления логических исследований:

- *неклассические логики* (среди них – многозначные, нечеткие, интуиционистские, паранепротиворечивые и др.), причем неклассические в собственном смысле слова, т.к. они отказываются или ослабляют классические логические законы;

- *интенциональные логики* (среди них – временные, нормативные, эпистемические, эротетические и др.), объектные языки которых включают имена содержательных сущностей;

- *логики модифицируемых рассуждений* (среди них – релевантные, немонотонные и др.), которые учитывают критерии естественности рассуждений.

Все эти логические теории связаны с исследованием границ применения наших познавательных способностей и в рамках обсуждаемой проблемы соответствуют пониманию построения каждой локальной (неуниверсальной) логики как стремления «сконструировать схему для рассуждений, скорее подходящих для простых смертных, чем для ангелов» (Да Коста и Френч 1991). Однако за оправданным интересом к ослабленным версиям логического следования и принципиально не элиминирующей субъекта (интеллектуально несовершенного, например, терпимого к противоречиям, без способностей к «логическому всеведению» и пр.) семантикой логических языков стоит отнюдь не попытка реабилитировать «торжество» неформальных рассуждений исключительно тех субъектов, что не являются искушенными в вопросах научного познания.

Часто, имея в виду специальную научную дисциплину, к термину «логика» применяют эпитет «формальная» (впервые это, по всей видимости, было сделано И. Кантом). Ставшее некогда привычным, сейчас это уточнение оказывается излишним: во-первых, все философско-интеллектуальные системы, известные под термином «логика», не исключая *содержательных* аспектов обоснования, искали принципы именно *оформления* мышления; во-вторых, несмотря на свободный поиск научного инструментария, именно *формальные* (в частности, математические) методы оказались по-настоящему стабильными и действенными. Конечно, для традиционного, пропедевтического понимания логики характерно определение ее как *науки о формах и законах правильного мышления*, однако именно дискурс, как «речь, погруженная в жизнь» (Н.Д. Арутюнова), то есть языковая практика, в широком понимании языка как семиотической системы, задает формы мысли и потому являет собой пространство логических исследований. Таким образом, для современного понимания логики приемлема довольно-таки широкая формулировка, которую использовал Г.Х. фон Вригт: «*логика изучает ... артикуляцию мысли в языке*» (1992: 83).

Хорошо известна полисемия слова «логика», причем множественность значений исходного «*λόγος*» усложняется непростой философской судьбой большинства из них. Важно помнить, что наряду со специально-научным значением термина «логика», которое опирается на трактовку рассуждений как особого рода дискурсивных актов, имеют место и онтологическое, и гносеологическое значения этого термина. И вряд ли будет состоятельным спор о наиболее верном или наиболее удачном употреблении, поскольку нельзя выделить «самое главное» из его значений, более того — весьма затруднительно

вообще провести жесткие границы между ними. Так что проще говорить о различных аспектах значения, каждый из которых сыграл определенную роль при выборе и закреплении термина «логика» в качестве имени рассматриваемой научной дисциплины, где, кроме собственно логических проблем, неизбежно встают вопросы философского характера об онтологических и гносеологических предпосылках семантики формальных языков различных систем логики. Поэтому философские системы оказываются интересными с точки зрения организации представлений о познании и формировании соответствующей концептуальной базы, в соответствии с исследовательской позицией ведущих специалистов, что «центральный путь развития логической науки не в ориентации на обыденные рассуждения, а в ее ориентации на более глубокие теоретические, философские основания науки и мышления в целом» (Смирнов 1989: 55). Вопрос о познании мира был и остается одним из центральных вопросов философии, здесь накоплен весьма богатый опыт раскрытия сущности познания и когнитивных способностей в целом. Современная логика с ее многообразием систем и философской обоснованностью формальных семантик их языков составляет самостоятельный, привлекательный в теоретическом и перспективный в практическом планах, но еще не проработанный должным образом подход к когнитивным исследованиям.

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РОЛЬ КОГНИТИВНЫХ ФАКТОРОВ В УСВОЕНИИ ЯЗЫКА

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Очевидно, что последовательность усвоения грамматических значений определяется целым рядом факторов, среди которых необходимо различать, по крайней мере, три разновидности: семантические, прагматические и когнитивные (Князев 2009). Среди них к когнитивным можно отнести относительную сложность восприятия:

непосредственно наблюдаемое явно доступнее, чем то, что требует длительного наблюдения и логических выводов; реальное доступней виртуального, а потенциально достижимое когнитивно проще невозможного. Эти соотношения отражаются и на процессе усвоения языка. Как считает Т. Гивон, «the order of acquisition reflects the order of cognitive complexity» (Givón 1990: 950).

На начальной стадии употребления глаголов они используются для выражения четырех типов значений: 1) наименование действия или

состояния, имеющего место в течение некоторого времени в момент высказывания; 2) непосредственно предшествующее событие; 3) высказывание относительно желаний или намерений ребенка в данный момент; 4) повелительное значение (Слобин 1984: 157). Соответственно, одной из основных тенденций, определяющей как последовательность усвоения значений многозначных грамматических единиц, так и пути расширения состава самих этих единиц является постепенное ослабление связи содержания высказывания с той конкретной ситуацией, в которой происходит речевое общение. Так, только в первой половине третьего года жизни дети начинают говорить о привычках, предположениях и других устойчивых свойствах, а также о многократных ситуациях, абстрагированных от непосредственного протекания во времени (Князев 2007: 452–458):

(1) *С Ка'иной **дуж'у*** (С Мариной дружу). *А с М'ишей не **дуж'у**, он всё п'ачет* (Оля М., 2, 4, 20);

(2) «*Эт' **с'ипют*** (Это то, чем щиплют сахар) (Женя Г., 2, 5, 25);

(3) *Нам так'ую в с'адике **да'ют*** (о гречневой каше) (Оля М., 2, 5, 21).

Что касается значений обусловленности, то можно сказать, что причинность относится прежде всего к реальной действительности, а условное значение – к возможному или предполагаемому. Соответственно, у детей, усваивающих русский язык, в число первых союзов неизменно входит причинный союз *потому что*:

(4) *Это бабушка, это старушка, **потому что** она уже в платочке* (Варя П., 2.00; комментарий матери: говорит, увидев куклу-девочку из набора для кукольного театра);

(5) *Аня, у тебя сопельки? Р.: **Тот'то*** (Потому что) *плакия я* (Аня С., 2.02.26; комментарий матери: Это уже не первый случай употребления причинно-следственного слова «потому что»; с его помощью Аня объясняет причину происходящего события, не используя полную конструкцию сложноподчиненного предложения);

(6) *Там нет Клидони, **п'таму** аنا хара-ит Клидона* (Там нет Гвидона, потому что он хвораёт, Гвидон) (Женя Г., 2.03.10);

(7) *Никак нам **выйти** на улицу. В.: Почему? Р.: **Потому что** там дождь* (Егор А., 2.04.20); *Не видно ксию, **мушто*** (потому что) *она куша-ит* (Оля М., 2.04.25).

Что же касается условных конструкций, то, например, у финских детей: «условный и уступительный союзы осваиваются позднее темпоральных и причинных союзов, приблизительно

к 3-м и, соответственно, 4-м годам» [Томмола 1998: 330–331]. Если же обратиться к условным конструкциям в целом, то среди них конструкции, обозначающие ирреальное условие, отмечаются в речи детей примерно на полгода позже обозначающих реальное условие:

(8) ***Если б'** з'эградит' вот тут, то никто б' ни праиол* (Женя Г., 3.04.02; комментарий отца: кладет длинную палку так, что она загораживает проход в комнату);

(9) *Ана эд'к р'в'е'ц'ь. А **если б'** ы'ё ни качать нагой, ана **б'** ни **р'вала**сь* (Женя Г., 3.04.11; комментарий отца: об отвязавшейся веревке, которая была прицеплена к ящику на дворе).

Одной из широко распространенных закономерностей усвоения русского языка является позднее овладение противительным союзом *но*, контрастирующее с ранним началом использования сопоставительного союза *а* в различных значениях, в том числе и в близком к противительному значении несоответствия:

(10) *Я тебе пригатила, **а** ты не ес* (ешь) (Женя Г., 2.06.07; комментарий отца: фраза из репертуара обеденных разговоров);

(11) *Прив'ёрт'в'ит, **а** сама-т'ь ни **смотрит*** (Женя Г., 2.07.10; комментарий отца: говорит, увидев, что девочка очень быстро листает книжку).

Между тем едва ли можно считать, что противительность в семантическом или когнитивном отношении значительно сложнее сопоставительности. По-видимому, в данном случае решающую роль играет то, с чьей точки зрения производится оценка ситуации. Сравнивая близкие по значению предложения с союзами *а* и *но*:

(12) *День был дождливый, **а** он не взял зонт*;

(13) *День был дождливый, **но** он не взял зонт*,

Е.В. Падучева заметила: «Различие между союзами *А* и *НО* – в том, что при союзе *НО* в роли субъекта, осознающего ненормальность совместного наступления *X* и *Y*, может выступать агент действия *Y*; тогда как в случае союза *А* ненормальность совместного наступления *X* и *Y* осознается только говорящим» [Падучева 1997: 43].

Вполне возможно, что позднее усвоение союза *но* связано с тем, что для его употребления необходимо научиться рассматривать ситуацию с точки зрения другого человека, а это сопряжено со значительными трудностями: «осознание чужих персональных точек отсчета вызывает у детей существенные трудности» [Диброва 2003: 446].

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СВЯЗЬ ЭМОЦИОНАЛЬНОГО ИНТЕЛЛЕКТА С УЧЕБНОЙ УСПЕШНОСТЬЮ МУЗЫКАЛЬНО- ИСПОЛНИТЕЛЬСКОЙ ДЕЯТЕЛЬНОСТИ

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В последние десятилетия поиск психологических механизмов, способствующих эффективной профессиональной реализации и построению адекватной и гибкой системы отношений личности с окружающей социальной средой, привел исследователей к выделению и изучению такого конструкта как эмоциональный интеллект (Goleman, 1995; Mayer et al, 1997; Робертс и др., 2004 и др.).

В ряде современных работ показана связь эмоционального интеллекта, измеряемого с помощью методики MSCEIT, V.2.0 (Mayer, Salovey, Caruso, 2002) с академической успеваемостью (например, Gil-Olarte et al, 2006). Однако изучение связи MSCEIT с музыкально-исполнительской успешностью студентов-музыкантов не проводилось.

В исследовании решалась двоякая задача – с одной стороны, осуществлялась проверка критериальной валидности русскоязычной версии методики MSCEIT v.2.0 (Сергиенко и др., 2010), его способности предсказывать учебную успешность музыкантов. С другой стороны, изучалась специфика эмоционального интеллекта в музыкально-исполнительской деятельности. Проблема выделения, описания и измерения способностей, наиболее важных для успешной деятельности в искусстве и, в частности, в музыкальном исполнительстве является одной из центральных в теории и практике психологии способностей и музыкальной психологии.

У студентов московских музыкальных вузов (N=60) измерялся уровень эмоционального интеллекта с помощью русскоязычной версии MSCEIT. Показателем академической успешности в нашем исследовании являлись учебные оценки студентов по специальности, полученные из официальных ведомостей.

Музыкально-исполнительские качества испытуемые оценивали по шести пятибалльным шкалам, перечень которых включал способности к идентификации музыкальных эмоций, творческую инициативу в интерпретации музыкального произведения, стрессоустойчивость в ситуации сценического выступления, способность к «сценическому раздвоению», экспрессивность и исполнительскую технику.

В результате проведенного исследования были обнаружены статистически достоверные связи эмоционального интеллекта с академической успешностью. Так, учебные оценки по специальности значимо положительно связаны со шкалами эмоционального интеллекта «использование эмоций в решении проблем», «понимание и анализ эмоций», «сознательное управление эмоциями» и общим баллом эмоционального интеллекта. Эти данные поддерживают предположение о существовании единых механизмов, обеспечивающих успешность деятельности в разных коммуникативных ситуациях, и в том числе в ситуации музыкально-исполнительской деятельности. Результаты исследования подтверждают критериальную валидность MSCEIT. Сопоставление средних значений и стандартных отклонений шкал эмоционального интеллекта с аналогичными показателями, полученными на другой выборке музыкантов в предшествующем исследовании (N=25; Князева, 2010), не выявило существенных различий между ними, что позволяет говорить о надежности полученных результатов.

Показано, что MSCEIT в целом лучше предсказывает академические оценки, чем самооценочные шкалы. Выявились положительные достоверные связи шкалы MSCEIT «сознательное управление эмоциями» с самооценочными факторами «контроль и регуляция эмоций» и «идентификация и выражение эмоций», выделенными в результате факторного анализа структуры музыкально-исполнительских способностей.

Было показано, что в условиях музыкального исполнительства эмоциональный интеллект получает специфическое преломление, определяемое особенностями музыкально-артистической деятельности. Например, показано, что выделенный фактор «контроль и регуляция эмоций» в условиях исполнительской деятельности включает способности к «сценическому раздвоению».

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ИЗУЧЕНИЕ ВЛИЯНИЯ КОНТЕКСТНЫХ И НЕ КОНТЕКСТНЫХ ДВИЖЕНИЙ НА ПРОТЕКАНИЕ ПРОЦЕССОВ ЗАПОМИНАНИЯ

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На протяжении нескольких десятилетий в рамках когнитивного подхода были проведены многочисленные исследования по изучению базовых познавательных процессов. Традиционно эти исследования проводились в условиях кратковременного (200–500 мс) предъявления стимульного материала, а также статичного положения наблюдателя. Предполагалось, что двигательные акты наблюдателя играют незначительную или даже отрицательную роль при выполнении когнитивных задач. Однако в реальной жизни решение многочисленных когнитивных задач, в результате которых происходит формирование ментальных репрезентаций окружающего мира, всегда сопровождается постоянными движениями наблюдателя, его тела, глаз, головы. Идеи влияния двигательной активности на процесс решения когнитивных задач активно обсуждались как в отечественных (Анохин, 1968, Леонтьев, 1975.), так и в зарубежных исследованиях (Brunswik E, 1956, Gibson, 1966, Prinz, 2007). Было показано, что успешность их выполнения зависит от согласованности зрительно-моторных координаций. Движения тела/головы, которые соответствуют контексту выполняемой задачи, называются контекстными (Brunswik E, 1956).

Цель. Мы исследовали влияние контекстных и не контекстных движений наблюдателя на успешность процессов запоминания. Наша гипотеза состояла в том, что выполнение не контекстных движений приведет к ухудшению запоминаемой информации.

Испытуемые. В эксперименте принимали участие 15 студентов (9 девушек, 6 юношей) факультета психологии МГУ. Все испытуемые имели нормальное или скорректированное к нормальному зрение.

Стимуляция. В качестве стимулов использовались 2 видеозаписи прохождения человека по 2-м лабиринтам с видом от первого лица. Лабиринты представляли собой систему помещений, связанных коридорами. На пути встречались различные объекты: окна, двери, лестницы, шкафы, стулья и т.п. Число поворотов составляло 21 в первом лабиринте и 19 – во втором. Большинство поворотов осуществлялось на 90 град. направо или налево и 3 поворота (для обоих лабиринтов) было сделано на 180 град.

Оборудование. Для предъявления видеороликов использовались очки виртуальной реальности eMagin Z800 3D Visor, которые состоят из двух маленьких видеомониторов, прикрепленных к голове так, чтобы каждый находился перед соответствующим глазом испытуемого. Очки были соединены с компьютером, на экране которого экспериментатор мог отслеживать все, что предъявлялось испытуемому, в режиме реального времени. Угловые размеры зрительного поля составляли 40x60 угл. градусов. Участники эксперимента находились в вертикальном положении с возможностью передвижения по

территории площадью 4 м². Ограничения в движениях были связаны лишь с длиной кабеля, соединяющего очки виртуальной реальности с управляющим компьютером.

Экспериментальный план. Испытуемому предлагалось посмотреть последовательно две видеозаписи прохождения лабиринтов. При просмотре 1-го лабиринта ему давалась следующая инструкция: «Сейчас вы увидите видеозапись прохождения лабиринта. Вы должны запомнить количество поворотов, которые встретятся на вашем пути. При выполнении задания вы должны повторять движения человека, от лица которого ведется съемка. Поворачивайтесь либо на 90 градусов направо/налево, либо на 180 градусов». При просмотре 2-го лабиринта инструкция изменялась: необходимо было выполнить ту же когнитивную задачу при совершении собственных движений камеры. Таким образом, испытуемые решали когнитивную задачу, выполняя при этом контекстные (первое задание) и не контекстные (второе задание) движения. Во время выполнения заданий экспериментатор фиксировал число неправильных поворотов, которое выполнялось при прохождении лабиринтов. После выполнения заданий испытуемые должны были назвать число пройденных поворотов, а также нарисовать карту лабиринта. Затем их просили дать самоотчет о ходе выполнения заданий и возникших затруднениях.

Результаты и их обработка. Для оценки успешности выполнения когнитивной задачи на запоминание подсчитывалось среднее число ошибок при подсчете поворотов по всей выборке испытуемых. Успешность выполнения двигательной задачи оценивалась как среднее число ошибок при совершении движений. Для оценки успешности формирования когнитивных карт анализировались рисунки лабиринтов.

Результаты показали, что процент ошибок при выполнении и первого и второго задания не зависит от типа движений (контекстные/не контекстные) и составляет в среднем величину 12%. Это означает, что обработка информации о двигательной и когнитивной составляющей происходит, скорее всего, по независимым каналам. Однако картина успешности выполнения двигательной задачи была иной: процент двигательных ошибок был равен 5% при выполнении контекстных и 27% при выполнении не контекстных движений. Анализ рисунков лабиринтов показал следующее. Во-первых, после выполнения и 1-го и 2-го заданий точность воспроизведения когнитивных карт была примерно одинаковой. Если рисунок лабиринта был плохо

прорисован (нарисована менее чем половина поворотов, ошибки в направлении поворотов) для первого задания, то он оставался таким же «мало информативным» после выполнения второго задания. Во-вторых, для обоих заданий более точно были описаны начала и концы путей прохождения по лабиринтам, по сравнению с их серединными частями, что подтверждает так называемые эффекты «первичности» и «недавности».

Из самоотчетов следовало, что для всех испытуемых было сложно воспроизвести план лабиринта, а также у них возникли субъективные трудности в выполнении поворотов в противоположную сторону.

Выводы. Таким образом, проведенный эксперимент показал, что в целом успешность выполнения когнитивной задачи мало зависит от типа движений (контекстные/не контекстные) наблюдателя. Успешность выполнения двигательной задачи резко ухудшается для случая выполнения не контекстных движений. Это можно объяснить, исходя из положений теории уровней построения движений Бернштейна (Бернштейн, 1997): введение осознанного контроля за собственными движениями приводит к разрушению их автоматичности. Ментальные репрезентации пространства формируются как когнитивные карты местности и связаны, в большей степени, с индивидуальными особенностями запоминания, чем с движениями тела наблюдателя.

Для комплексного изучения процессов решения когнитивных задач при активных перемещениях наблюдателя необходимо провести это исследование на большей выборке испытуемых, а также ввести дополнительную регистрацию психофизиологических характеристик при выполнении наиболее сложных заданий.

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СТРАТЕГИАЛЬНЫЙ ПОДХОД В ИССЛЕДОВАНИИ ОПЕРАЦИОНАЛЬНОГО СОСТАВА ПРОЦЕССА ПОНИМАНИЯ

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Как форма мышления субъекта, стратегии в то же время могут быть применены и к объяснению процесса понимания, ведь процесс понимания любого нового материала соответствует тому, что происходит при решении творческой задачи. Стратегия применяется не только в случаях решения творческих задач, но и понимания текстов, наглядности, другого человека и всего, что является новым для субъекта.

Действия с новым материалом, понимание его – это творческий процесс. Результат его – выделение смысла как сжатой схемы всего материала. Постигнув смысл, субъект способен воспроизвести весь материал, но уже «своими словами». Осмысленные знания продвигают субъекта в его психическом развитии, ведь только такие знания могут продуктивно использоваться в дальнейшем. Поэтому уровень сформированности стратегий может считаться важной характеристикой психологической готовности личности к деятельности в целом.

Под стратегией понимается не только путь, который избирает субъект для понимания, не только набор логических операций, которые сопровождают процесс понимания, но и то, как происходит понимание, как отыскиваются знания и происходит их сопоставление с новой информацией (Моляко В. А., 2007).

В нашем исследовании трактовка понятия «творческая задача» обуславливается характером протекания ее решения (Коваленко А. Б., 1999, Моляко В. А., 2007), потому что, как свидетельствуют результаты исследований, одна и та же задача может быть творческой для одного человека и нетворческой для другого. По нашему

мнению, творческая задача как модель творческой деятельности должна быть многосмысловой, а также иметь скрытую проблемность. В некоторых случаях она предполагает несколько вариантов решения, и один из них – шаблонный, стереотипный, с помощью соответствующего алгоритма; другой – нешаблонный, творческий, который возникает вследствие понимания субъектом скрытой проблемности задачи.

Каждый из выделенных вариантов решения творческой задачи основывается на разных обобщенных схемах, построенных на основе подходов к задаче с преобразованием алгоритмических или творческих процессов мышления. Указанные схемы отражают тот или иной смысл задачи: алгоритмический или скрытый, который является ключом к ее решению. Наличие нескольких смыслов, которые содержатся в основе того или иного способа решения, является обязательной чертой задач творческого (проблемного) типа.

Мы рассматриваем задачу в широком ее понимании, а именно – не только как типовую, а такую, которая учитывает состояние субъекта, которому необходимо понять что-то новое, до этого не известное. Такой подход дает возможность моделировать с помощью творческих задач любую творческую деятельность, когда субъект сталкивается с необходимостью понять новую для него информацию.

Анализ результатов исследования процесса понимания творческих задач позволил нам выделить разные стратегии понимания испытуемыми творческих задач. Главным критерием выделения стратегий является сложность тех или иных механизмов мыслительной деятельности, отдельных операций, которые обеспечивают их функционирование.

Наиболее распространенной стратегией является стратегия поиска аналогов. Поиск

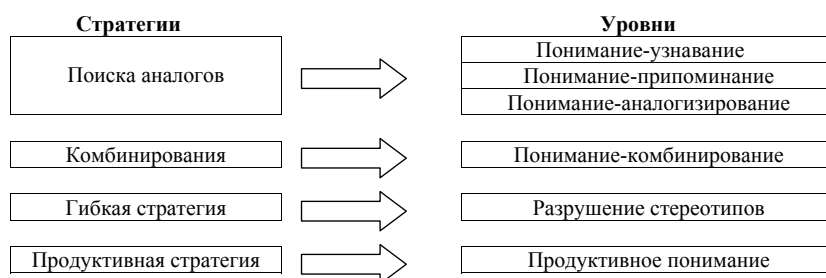


Схема 1. Взаимосвязь между процессуальными и результативными характеристиками понимания

смысла путем применения стратегии аналогизирования происходит на основе сопоставления новой информации с существующими в памяти субъекта эталонами.

Более сложной является стратегия комбинирования. Она заключается в том, что субъект обращается к сопоставлению составляющих частей задачи или к конструированию составных частей различных элементов, содержащихся в различных эталонах.

В ситуации, когда субъект отказывается от предыдущего способа решения, речь идет о так называемой гибкой стратегии. Она проявляется в способности субъекта к широкому анализу проблемы, к отказу от шаблонного способа решения, если последний не дает желаемого эффекта.

В том случае, когда субъект не только решает творческие задачи, но и сам формирует определенные знания, можно говорить о продуктивной стратегии. Данная стратегия дает возможность субъекту достаточно быстро находить правильное решение, отыскать скрытый смысл. В результате анализа информации субъект на основе наличных знаний и опыта продуцирует новые знания, делает новые выводы, находит новые пути решения проблем.

Использование той или иной стратегии определяет уровень понимания, на котором находится субъект. Если стратегии отражают процессуальную сторону понимания, то уровни

являются результатом этого процесса и на их основе можно сделать вывод о степени операциональной сложности материала, который доступен для понимания данному субъекту.

Мы выделили шесть уровней понимания: узнавание, припоминание, аналогизирование, комбинирование, разрушение стереотипов и продуктивный уровень.

Выделенные уровни взаимосвязаны между собой: каждый последующий уровень включает предыдущие, и их качества могут проявляться уже на более высоком уровне. Выделенные уровни дают возможность проследить также динамику понимания субъектом творческих задач.

Таким образом, стратегии являются не только условием успешности решения задачи, но и свидетельством готовности личности к творческой деятельности. Уровень функционирования мыслительных стратегий определяет уровень понимания субъектом творческих задач.

Выделенные уровни понимания творческих задач дают возможность сделать вывод об уровне психического развития личности: от понимания-узнавания до творческой одаренности.

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СИМВОЛ СОЗНАНИЯ И СИМВОЛ КУЛЬТУРЫ В КОГНИТИВНОЙ ПАРАДИГМЕ

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Культура как предмет культурфилософского исследования впервые в своей целостности осмысливается у Канта, который рассматривает символ в качестве основной категории культуры, определяя традицию посткантовского развития философии культуры. Символ в его концепции остается в рамках мышления субъекта, представляя собой форму интуитивного познания, косвенное средство рассудка, подводящее идеи разума под чувственные созерцания, которые не могут им соответствовать. Культура рассматривается как способность человека к целостно-символическому осмыслению мира.

Дальнейшее развитие понимания символа в культурфилософской традиции приводит к неокантианскому подходу к символу и культуре — символ становится функцией сознания, а культура — способом существования человека символического ('animal symbolicum'). В русской философской традиции осмысления символа особый интерес представляет русская религиозная философия, которая, опираясь на европейскую традицию, переосмыслила ее в рамках своего подхода. И здесь особая роль принадлежит «последнему из классических русских философов» — А. Ф. Лосеву, который рассматривал символ как бытие, как синтез идеального и реального, как основу человеческой жизни и культуры.

А. Ф. Лосев определил два типа символов:

- символ как принцип символизма (*символ сознания*), т. е. диалектическое тождество

идеального и реального, общего и индивидуального (символическая функция сознания). Этот принцип охватывает всю культурную деятельность человека;

- символ как форма воплощения идеи (*символ культуры*). Символ вещи является оформлением «идейно-образного» построения вещи, причем идейная образность для того, чтобы быть символом, должна «указывать на нечто другое, что не есть она сама, и даже быть для этих других предметов законом их построения». Символ – это развернутый знак, а знак – «зародыш» символа.

Такой подход дал возможность А. Ф. Лосеву считать, что вся осмысленная деятельность человека символична.

Особую роль в становлении когнитивной культурологической парадигмы сыграл структурализм, в рамках которого символическая функция связывается с бессознательной деятельностью духа (Леви-Строс, Барт), т.е. символ остается внутри человеческого мышления (коллективного), выражая его психическую сущность. В рамках подхода Ю. М. Лотмана символическая функция сводится к «мыслящему устройству» (механизму порождения случайности), что приводит его к бессубъектному механистическому пониманию культуры. Значение рассмотренных концепций для развития когнитивной теории культуры заключается в том, что они позволяют рассмотреть культуру в качестве надиндивидуальной детерминации человеческого существования и поставить вопрос об исследовании взаимодействия культуры и индивидуального мышления на уровне как сознательных, так и бессознательных процессов.

Когнитивная антропология. В качестве символа сознания в концепции М. Коула выступает когнитивный артефакт, т.е. процесс переработки информации при выработке когниции физических артефактов, а в качестве символа культуры – культурный артефакт, играющий роль когниции для индивида. В его концепции культура – это процесс человеческого познания, протекающий как внутри, так и вне человеческой психики и опосредованный артефактами; это воплощение артефактов в широких социокультурных системах, организующих практическую деятельность людей, в которой эти артефакты используются.

Значимая система как культурная единица существует только в коммуникации, поэтому Р. Д'Андрад проводит различие между сообщением и значением, отмечая, что современные работы в области когнитивной психологии трактуют значение не как представление о

внешней форме, а как отдельную целостность, имеющую сложные принципы организации, поэтому он предлагает использовать термин «значимая система» для ментальных структур и процессов, а термин «символ» – для внешних знаков. Следовательно, символ сознания в его концепции – это ментальная значимая система, а символ культуры – это внешний знак, воплощение культурной значимости. В его концепции культура – это «ментальная экипировка» членов общества: знание и понимание символических значений и следование социальным соглашениям; это физическое воплощение этих значений и правил во внешних знаках и социальных действиях (поведении).

Когнитивная культурология. Одним из важнейших терминов современной когнитивной науки является термин «концепт», который в когнитивной культурологии определяется как единица структурированного и неструктурированного знания, образующего когнитивность отдельного человека и культуры в целом. Концепты выступают в когнитивистике в роли «символов сознания», связывая «субъективность» внутреннего сознания с «объективностью» внешнего мира, и поэтому в рамках когнитивной культурологии ставится задача исследования взаимообусловленности «символа сознания» и «символа культуры».

Культурные концепты – один из основных «ментефактов культуры», с помощью которого осуществляется взаимодействие надиндивидуальных семантических структур и когнитивных структур индивидуального сознания. В рамках когнитивного подхода к культуре мы наблюдаем развитие идей А. Ф. Лосева относительно пути, «который проходит эйдос первоначала, отраженный в инобытии» и который является фактически «превращением и преображением символа» в сознании, но уже не в самом по себе, а во взаимодействии сознания надиндивидуального и индивидуального в процессе деятельности, и более того, сознание понимается как мышление в целом, включающее как сознательные, так и бессознательные процессы. Символ сознания рассматривается с точки зрения его структуры.

В рамках когнитивной культурологии символ рассматривается как важнейшая когнитивная форма культуры, как когнитивно-лингвистический артефакт (категория), как знак, который предполагает использование своего первичного содержания в качестве формы для другого содержания.

В рамках когнитивного подхода к культуре символ, лишаясь своей эйдетической составляющей, отождествляется со знаком и

рассматривается как символ культуры, а собственно познавательные функции символа (символ сознания) переданы концепту как ментальной структуре.

Таким образом, осмысление проявленных форм культуры прошло путь развития от понимания любой культурной формы как символической (Кассирер, Лосев) до понимания символа культуры как одной из форм культуры. Понимание символа как внутреннего представления человека познающего (И. Кант)

представляется в когнитивной теории культуры в качестве концептуального образования.

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МОДЕЛЬ УЗНАВАНИЯ ОБЪЕКТА ПО ИЗОБРАЖЕНИЮ НА ОСНОВЕ ДЕРЕВА ПРИНЯТИЯ РЕШЕНИЙ

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При создании эффективных систем классификации и детектирования визуальных изображений необходимо опираться на те принципы переработки информации в высокоорганизованных живых организмах, которые связаны с их когнитивной деятельностью. В связи с этим одним из важных направлений в изучении биологических систем является изучение механизма принятия решений и способов построения программ для достижения целей. Только на этом пути можно находить архитектуры систем распознавания для конкретных прикладных задач, оптимально сочетающие блоки параллельной обработки информации с цепочками последовательного принятия решений. Исследования последних лет показали, что основной особенностью когнитивных биологических систем перед их современными искусственными аналогами является способность первых динамически формировать последовательность признаков и/или действий для достижения необходимых результатов, которые определяются целевой функцией. Так, например, если перед человеком ставятся две задачи: задача распознавания конкретного человека из предъявленного списка и задача поиска любых лиц в видеоролике, формируются разные сети для принятия решения [1]. Можно предположить, что биологическая система ограничивает множество признаков в зависимости от целевой функции, причем этот процесс «вытормаживания» признаков тем эффективней, чем более обучена система [2].

Вследствие этого в системе формируется такая динамика проверки гипотез, в которой история предыдущих проверок влияет на выбор гипотез в будущем. Эффективность «вытормаживания» признаков и последовательность проверки гипотез определяют скорость принятия решения системой.

В работе предлагается алгоритм принятия решений, по своей архитектуре наиболее соответствующий известным на сегодня свойствам высокоорганизованных биологических систем. Разработанный алгоритм генерации дерева принятия решений для системы детектирования объектов на изображении является одним из вариантов рекурсивных алгоритмов. На этапе обучения по экспериментальной базе изображений лиц создается модель последовательности «осмотра» признаков локальных частей лица, которая состоит из бинарных узлов дерева принятия решений. Такой узел включает в себя локальный измеряемый признак на изображении и вероятности решений при любом исходе измерения этого признака. Добавление признаков в модель происходит до тех пор, пока оценка вероятности одной из возможных гипотез не превысит заданную пороговую величину.

В предложенном алгоритме используется набор быстро вычисляемых признаков, использующий наложение функций Хаара-подобных на обрабатываемое изображение [3], и имеющий регулируемый порог срабатывания. Таким образом, формируется достаточно большой набор первичных детекторов, работающих по различным фрагментам изображения и функционально аналогичных рецептивным полям зрительной системы.

Основной особенностью предлагаемой архитектуры системы детектирования является

задание целевой функции, устанавливающей маску-фильтр на набор признаков таким образом, что каждая проверка оставшихся признаков уменьшает степень неопределенности достижения целевой функции. Таким образом, базовый набор признаков является операционной средой когнитивной системы, которая особым образом конфигурируется под каждую задачу и тем лучше, чем больше опыта у системы в решении этой задачи.

Предлагаемая архитектура системы детектирования объектов на изображении обеспечивает такую последовательность проверки признаков, которая позволит принимать решение о принадлежности объекта к заданному классу с заданным уровнем ошибки за минимальный промежуток времени. Для обеспечения этого необходимо, чтобы:

- количество признаков в последовательности было минимально;

- каждый признак наблюдался в большинстве обучающих предъявлений.

Предложенный алгоритм позволяет формировать ту последовательность признаков, которая оптимально соответствует условиям конкретной задачи детектирования и позволяет осуществлять дообучение системы на ранее не использованные изображения объектов.

Эффективность метода находится на уровне широко известного алгоритма SVM, при этом превосходя его по вычислительной простоте.

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ЗАВИСИМОСТЬ ВЛИЯНИЯ ДЕПРИВАЦИИ СНА НА ПРОЦЕССЫ ОРГАНИЗАЦИИ ПРОСТРАНСТВЕННОЙ ПАМЯТИ ОТ ХАРАКТЕРА ОБУЧЕНИЯ КРЫС В ВОДНОМ ТЕСТЕ МОРРИСА

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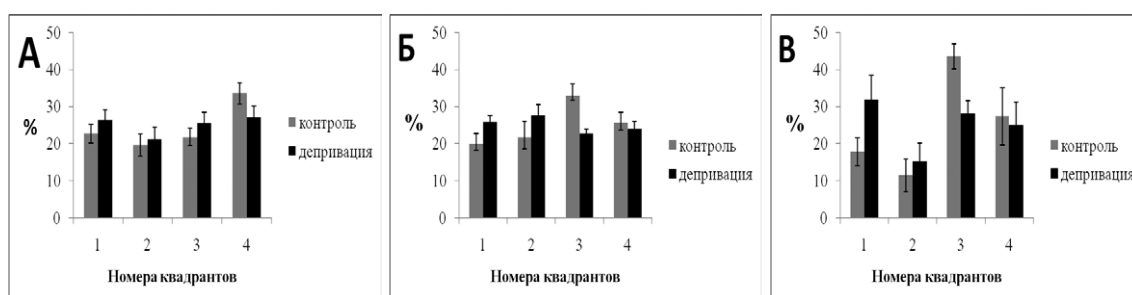
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Исследовали пространственную версию водного теста Морриса, позволяющую изучать гиппокамп-зависимую память, которая приравнивается к декларативной памяти у человека. Единое мнение относительно процессов, определяющих положительное влияние сна на процессы развития памяти, отсутствует до сих пор. Знание механизмов влияния депривации сна на процессы организации долговременной памяти представляет интерес как для разработки подходов по усовершенствованию процессов обучения и памяти, так и для борьбы с когнитивными нарушениями. В этом плане информативным может оказаться сопоставление нарушений, возникающих под влиянием депривации сна на воспроизведение навыков, длительно сохраняющихся после одно- и многодневного обучения.

В экспериментах участвовало 20 взрослых крыс-самцов линии Вистар массой 180–200 г. Использовали экспериментальную парадигму,

включающую обучение крыс в водном тесте Морриса и депривацию сна с помощью бесстрессорной карусельной методики. Обучение заключалось в безусловнорефлекторном избегании принудительного плавания путем нахождения крысой скрытой под водой платформы. Оно проводилось по протоколу Ч. Уорд с соавт. (Ward et al., 2009 г.): на поиск платформы давали 8 попыток из 4 стартовых точек бассейна, выбираемых в псевдослучайной последовательности. Время поиска ограничивали 120 с, между попытками крыса находилась на платформе в течение 20 с. Многодневное обучение проводили с перемещением платформы: в первый день обучения целевым (в котором находилась платформа) был четвертый квадрант, на третий день – третий квадрант и на четвертый день – первый квадрант. При тестировании на запоминание через 24 часа после обучения крысу помещали в квадрант, расположенный по диагонали к целевому квадранту (платформа в данном случае из бассейна изымалась), и давали возможность ей плавать в течение одной минуты. Обучение проводили, используя программу Ethovision (версия 3.1) с автоматическим способом анализа передвижения крыс на установке фирмы «Noldus» (Нидерланды). Статистический анализ данных проводили с помощью пакета программ Statistica 6.0.

В качестве показателя, характеризующего проявление когнитивных (познавательных) процессов, выступало относительное (в %) увеличение длины пути, преодолеваемого крысой в целевом квадранте в сравнении с тремя другими квадрантами. Анализ суммарных (по всем опытам) данных, полученных при изучении влияния депривации сна на воспроизведение выработанного навыка через 24-часа после однодневного обучения (рисунок А), показал ухудшение памятного следа в целевом, в данном случае четвертом квадранте, которое было на грани достоверности ($p = 0.06$). Депривация сна после трехдневного обучения (рисунок Б) приводила к достоверному ($p = 0.004$) уменьшению пути, преодолеваемого крысой в целевом (третьем) квадранте. Наряду с этими данными показано, что в тестирующей пробе на память после четырехдневного обучения (рисунок В), во-первых, длина пути максимально увеличилась не в целевом (первом) квадранте, а в третьем квадранте, который был целевым накануне (при обучении на третий день). В этом же третьем квадранте происходит достоверное ($p = 0.02$) уменьшение под влиянием депривации сна пройденного крысой пути.



Полученные данные подтверждают ранее выявленный отрицательный эффект депривации сна на длительную память (Дорохов с соавт., 2011). Однако после однодневного обучения, проводимого в данной работе, уменьшение длины пути под влиянием депривации сна было менее выраженным, чем в предыдущей работе, в которой обучение проводили по протоколу К. Фрик с соавт. (Frick et al., 2000). По последнему протоколу пробы предъявляли тремя сериями с 30-минутными перерывами. Возможно, в этом случае уже во время обучения имеет место развитие процессов, лежащих в основе мембранной пластичности, способствующей усилению синаптической эффективности как основного механизма обучения и памяти. Как было показано в работе Р.Г. Кожедуб (2001: 63), именно за 30-минутный промежуток времени после тетанизирующего воздействия на корковые нейроны

происходит повышение электровозбудимости корковых нейронов, при котором процесс усиления синаптической эффективности ускоряется и достигает уровня «насыщения». Можно думать, что эффект максимального увеличения когнитивного показателя в третьем квадранте при трехдневном обучении обусловлен теми же процессами, что и процессы, лежащие в основе максимального проявления памяти при трехдневной схеме обучения с применением широко используемого классического протокола Морриса. Максимальное проявление памятных следов после четырехдневного обучения в квадранте, который был целевым на третий день обучения, возможно, является следствием полного завершения стадии консолидации. При действии обстановочных стимулов на стадии реконсолидации, следующей за стадией консолидации после обучения на четвертый день, по-видимому, возникает реактивация уже сложившейся накануне репрезентации памятного следа. При стабилизации процессов, определяющих памятный след, на этой стадии возможна амнезия (см. Балабан, Коршунова, 2011; Nader et al., 2000).

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АУТИСТИЧЕСКИЕ РАССТРОЙСТВА КАК МОДЕЛЬ УТРАТЫ ПОНИМАНИЯ: ИНФОРМАЦИЯ К РАЗМЫШЛЕНИЮ

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Десятилетний опыт работы с детьми, имеющими отставание в психическом развитии, дает богатую пищу для размышлений не только над статистически достоверными изменениями нарушенных функций после применения транскраниальных микрополяризаций (ТКМП – tDCS), но и над отдельными реальными событиями в жизни индивидуума.

Дошкольники, о которых идет речь, как правило, не владеют полностью навыками самообслуживания (туалет, еда, одевание), не смотрят в глаза, не откликаются на свое имя, не слушают, когда им пытаются читать книжки, не смотрят мультфильмы, не играют в игрушки, не реагируют на просьбы родителей, не владеют речью, что в совокупности делает невозможным или затруднительным их пребывание в общественных местах в связи с неадекватным поведением.

Формальная оценка результатов тестирования на разных этапах лечебного процесса содержит, как правило, стандартный вердикт: уровень психического развития ребенка ниже возрастной нормы. Мы движемся в своей деятельности с другого конца континуума развития и сравниваем ребенка с тем, каким он к нам пришел (Кожушко, 2008–2011; Кожушко, Матвеев, 2010). Именно процесс наблюдения за поведением детей в привычных условиях ставит вопросы, выходящие за рамки коррекционной психологии и дефектологии.

Что происходит с детьми дома уже после 1–2 сеансов воздействия (каждое продолжительностью всего 20 мин)? Со слов родителей: «Стал оборачиваться, когда я его зову», «У него стало человеческое лицо», «Плачет теперь как обычный ребенок, а не воет как зверь», «Стал наливать воду в стакан и останавливаться, когда вода доходит до края», «Начал обходить лужи, а не вступать в середину – как будто стал их видеть на дороге», «Стал играть с котом, который у нас уже 5 лет и на которого раньше не обращал внимания», «Стоял сегодня перед телебашней полчаса, как будто увидел ее в первый раз, хотя мы гуляем около нее каждый вечер», «Понял, что если мяч укатился под диван, он не исчез совсем, и впервые сам догадался наклониться и посмотреть под диван», «Стоял у окна и впервые начал махать мне рукой, увидел, что я иду

по двору. Раньше, даже если ему показывали пальцем, где я, не мог понять, чего от него хотят, вырывался», «Остановился около зеркала и долго строит гримасы, как будто понял, что это – его отражение» и т. п.

То есть ребенок не просто смотрит, а видит, не просто слушает, а слышит, будто начинает идентифицировать, узнавать объекты в фокусе, и соответственно реагирует, догадывается о чем-то. Приведенный перечень довольно разнообразный по содержанию, чтобы можно было говорить о динамике развития какой-то одной психической функции. Больше похоже на цепочку внимание – понимание (уместно ли в таком возрасте говорить об осознании?). Возникает впечатление, что ребенок по-другому начинает воспринимать мир вокруг себя и себя в этом мире. Как будто из пестрого фона внешних раздражителей, который ранее был похож на белый шум, выделяется центральная фигура, которую можно рассмотреть и даже что-то с ней сделать. Следом за этим разворачивается целая череда самых разнообразных перемен: повышение адекватности поведения, уменьшение расторможенности, улучшение обучаемости, преобладание позитивных эмоций и многое другое.

Что это: «настройка» нужного канала восприятия (понимания) на нужную волну или частоту? Инициация понимания обращенной речи, которая перестает быть пустым, лишенным смысла, набором звуков и начинает выступать как руководство к действию («подойди, посмотри, возьми, дай...»)? И тогда взрослый (родитель) становится переводчиком, проводником между этим новым незнакомым миром и ребенком, перед взором которого будто все начинает проясняться. («Я теперь знаю, что это такое!»).

Трудно представить, что за такой короткий интервал времени воздействия (десятки минут) могут быть сформированы столь сложные процессы. Скорее, происходит активация механизмов, хоть и серьезно поврежденных, но заложенных в мозгу у каждого ребенка исходно, как эволюционный багаж, как спираль развития, которая постепенно раскручивается в ходе естественного онтогенеза. И это – целая система знаний, смыслов, контекстов, обобщений, когда слово – это и указание на объект «что это?», и, позднее, руководство к действию («что делать?»).

У детей с расстройствами аутистического спектра, даже когда они приобретают

способность развиваться с ускорением, формализованность приобретенных навыков устной и письменной речи остается на первом плане: заученные фразы-штампы, умение «перерисовывать» сложные слова, не понимая их значения, умение бегло читать, не понимая содержания (дети не могут прокомментировать сюжет, проиллюстрировать текст, ответить на вопрос по сюжету, не говоря уже о пересказе текста своими словами). Что, впрочем, не мешает им быстро осваивать виды деятельности, не требующие коммуникации с человеком (работа с компьютером).

Знак (буква, цифра) заучен, но либо лишен смысла, либо его понимание носит конкретный, узкий характер. Исключения из правил правописания, переносный смысл слов, поговорок, шутки – все это представляет больше трудности для усвоения и употребления в разговорной речи такими детьми. Диалог, особенно с новым человеком, затруднен, так же как речевая

инициатива или ответ на вопрос, то есть нарушение коммуникативных функций остается до конца не преодоленным. Может, это – следствие коммуникативной «катастрофы» в самом начале пути новорожденного человека, когда в критический момент по малопонятным пока причинам не произошло включение нужного кода или настройки на камертон взаимодействия с внешним миром? Что выступает в роли камертона?

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МНЕМИЧЕСКИЕ ОШИБКИ В ПОЖИЛОМ ВОЗРАСТЕ И ГЕТЕРОГЕННОСТЬ ЦИНГУЛЯРНОЙ КОРЫ

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Настоящее исследование проведено на группе 29 женщин без истории неврологических и психиатрических заболеваний в возрасте от 60 до 76 лет. Память испытуемых комплексно тестировалась по методике А. Р. Лурия (модификация Ж. М. Глозман, 1999). Для каждого вида памяти оценивались: 1. объем памяти (количество воспроизведенных элементов); 2. прочность памяти (количество воспроизведенных элементов после интерференции); 3. ошибки памяти: А. замены элементов; В. конфабуляции (включение новых элементов); С. контаминации (смешение нескольких элементов); D. персеверации (многократное воспроизведение одного элемента); Е. ошибки порядка следования элементов. Дополнительно на магнитно-резонансных томограммах головного мозга испытуемых для каждого из полушарий выделялись четыре области цингулярной коры – передняя (поля 24 и 33 по Бродману), задняя вентральная (поле 23 по Бродману), задняя дорсальная (поле 31 по Бродману) и ретроспленальная (поля 26, 29 и 30 по Бродману) и вычислялись абсолютные (в мм²) показатели площади поверхности этих областей

мозга. В ходе обработки на основе полученных данных были рассчитаны непараметрические корреляции (коэффициент Спирмена) между индивидуальными поведенческими и анатомическими показателями. Анализировались только статистически значимые ($p < .05$) взаимосвязи.

Обнаружено, что размеры передней цингулярной коры в левом полушарии отрицательно коррелируют с числом конфабуляций в пробах на семантическое кодирование ($R = -.51$) и воспроизведение слов ($R = -.32$), увеличивая, таким образом, точность воспроизведения. Одновременно, для передних отделов цингулярной коры правого полушария наблюдается отрицательная корреляция с общим объемом воспроизведенного вербального ($R = -.32$) и особенно невербального материала ($R = -.37$), то есть чем больше площадь данной области мозга, тем меньше предъявленных ранее элементов воспроизводится испытуемыми.

Кроме того, значимые корреляции были выявлены между результатами нейropsychологических тестов и площадью вентральной части задней цингулярной коры. Размеры этой области справа уменьшают количество ошибок конфабуляционного типа в пробах на семантическую память ($R = -.40$). Вместе с тем у испытуемых с относительно обширной левой вентральной областью наблюдаются многочисленные ошибки,

связанные с изменением порядка воспроизведения элементов ($R=.37$ – для вербальных тестов и $R=.41$ – для невербальных) и их персевераторного повторения ($R=.33$ – для вербальных тестов и $R=.40$ – для невербальных).

Содержательно площадь дорсальной части задней цингулярной коры в левом полушарии отрицательно связана с объёмом памяти по вербальным ($R=-.49$) и невербальным ($R=-.45$) тестам, а также увеличивает интерференцию материала ($R=-.45$) и число конфабуляций ($R=.44$) в пробе на запоминание групп слов и фраз. Размеры правой дорсальной области отрицательно связаны с ошибками в порядке воспроизведения элементов в пробе на зрительную память ($R=-.46$).

Увеличение ретроспективной области цингулярной коры коррелирует с уменьшением числа семантических ошибок памяти по типу контаминации ($R=-.43$), но одновременно значительно снижается также и количество извлечённых из памяти элементов в тестах на зрительную память ($R=-.53$). Причём такое снижение происходит независимо от интерференционных воздействий.

Обнаруженные взаимосвязи могут быть, в самом первом приближении, обобщены с помощью представлений о передне-заднем градиенте развития кортикальных функций, а также об известных различиях в функциях левого и правого полушарий (см. Величковский, 2006; Кроткова, Величковский, 2008). В направлении от задних к эволюционно более новым, передним областям коры увеличивается степень амодальности наблюдаемых эффектов и их связь с переработкой семантической информации, что выражается в нашем случае подавлением конфабуляций. Кроме того, левополушарные структуры чаще обнаруживают связь с результативностью вербальных тестов, чем правополушарные. Так, размеры передней цингулярной коры отрицательно коррелируют с числом конфабуляций в пробах на семантическое кодирование, что является важным признаком интактности префронтальных функций мозга (см., например, Turner et al., 2008). Несколько парадоксальный характер взаимоотношений результативности тестов на память с размерами большинства областей цингулярной коры мог бы получить объяснения в рамках традиционных представлений о выполняемой ее функции центрального произвольного регулятора когнитивной активности,

тормозящего потенциально иррелевантную информацию.

Единая картина глобального градиентного изменения показателей функционирования памяти, с одной стороны, и локализации областей цингулярной коры, с другой, резко нарушается контрастными свойствами ее дорсальной части (поле 31). Эта область, во-первых, уникальна с точки зрения общего числа корреляций с тестами на память, и, во-вторых, является единственной областью, демонстрирующей положительную корреляцию с количеством конфабуляций.

Наше объяснение этого отличия, а равно общее представление о роли обследованных областей цингулярной коры в функционировании памяти человека состоит в следующем. Роль передней цингулярной коры состоит в отвержении иррелевантной информации, в борьбе с интерференцией. Используя терминологию теории обнаружения сигналов, её можно назвать системой фильтрации и подавления «шума». Это объясняет, почему при хорошо развитой передней цингулярной коре снижение количества ошибок памяти в виде конфабуляций сопровождается общим снижением результативности извлечения из памяти: выбор консервативного критерия принятия решений обеспечивает хорошее подавление «шума» и сокращает число «ложных тревог», но одновременно снижает и число «правильных обнаружений». Роль же задней дорсальной цингулярной коры, по нашему мнению, противоположна – она занимается первоначальным выделением полезной информации, то есть играет роль генератора потенциальных «сигналов» в системе выделения «сигнала» из «шума». Фактически мы выдвигаем гипотезу о существовании двух базовых подсистем цингулярной коры, реципрокно влияющих на выполнения нейропсихологических тестов на память, а возможно, и на другие когнитивные процессы.

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ВСЕГДА ЛИ ПРОГРЕСС В ТЕХНОЛОГИИ ВЕДЕТ К ПРОГРЕССУ В ПСИХОЛОГИЧЕСКОЙ ЭФФЕКТИВНОСТИ? О ПСИХОЛОГИЧЕСКОМ ПРЕИМУЩЕСТВЕ АНАЛОГОВОЙ ФОТОГРАФИИ

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Иконическая память была открыта Дж. Сперлингом в 1960 г. Изобретение фотографии, которая по существу представляет собой внешний аналог иконической памяти со снятым ограничением по времени хранения информации, состоялось на 120 лет раньше. Развитие технологии фотодела шло по пути индивидуализации и контролируемости процесса производства фотоснимка. Если в первые десятилетия фотографирование было делом хорошо подготовленных профессионалов, то после того, как Дж. Истмен разработал портативный фотоаппарат и внедрил сервисную сеть по проявке пленки и печати фотографий, практически каждый получил возможность инициативно создавать собственный архив «ключей» к своим личным воспоминаниям. Пассивное позирование фотомастеру сменилось активным фотографированием со все более предсказуемым результатом (первый фотоаппарат с автоматическим управлением диафрагмой появился в 1938 г.). Переломным моментом стал 1984 г., когда компания Кэнон представила первую цифровую фотокамеру, а в 1994 г. впервые стало возможным хранить и обрабатывать фотографии в персональном компьютере.

На рубеже 20 и 21 вв. цифровая фотография завоевывала всё большую популярность и начинала конкурировать с традиционной пленочной фотографией. Несомненное преимущество цифровых камер – возможность сразу увидеть и оценить на дисплее результат съемки, т.е. полностью проконтролировать свойства объекта, который впоследствии будет напоминать о пережитом событии прошлого. В 2006 крупнейший производитель аналоговых камер корпорация Nikon заявила о снятии их с производства.

Однако, по нашему мнению, открытым остается вопрос о том, всегда ли прогресс в технологии создания средств регуляции памяти тождественен прогрессу в психологической эффективности изобретения? Существуют ли различия в воспоминаниях, инициированных аналоговыми и цифровыми фотографиями?

Поэтому **целью** нашего эмпирического исследования стало выявление различий в воспоминаниях об одном и том же событии с опорой

на фотографии «на память», полученные аналоговым способом (низкий уровень контроля результата) и цифровым способом (высокий уровень контроля результата).

Согласно **гипотезе** исследования, контроль создаваемого для последующей регуляции воспроизведения средства трансформирует процесс кодирования эпизода, сокращая объем фиксируемой в памяти дополнительной информации.

Участниками полевого исследования стали 16 студентов.

Процедура исследования. На первом этапе каждый из участников получил по два фотоаппарата – аналоговый и цифровой с инструкцией сделать за время концерта в музыкальном клубе по 12 фотографий: 6 фотографий – аналоговым фотоаппаратом и 6 – цифровым. Все снятые материалы были сданы исследователю. На втором этапе спустя 2 недели каждый из участников встречался с исследователем и описывал воспоминания, возникающие при рассматривании отобранных случайным образом трех цифровых и трех аналоговых фотографий, сделанных им самим. Велась аудиозапись с последующей транскрипцией. На третьем были приглашены 7 экспертов – психологов. Они оценивали каждое воспоминание, относя его к одному из двух типов: 1) типу А – воспоминание, описывающее непосредственно момент съемки кадра; 2) типу В – воспоминание, в котором человек отталкивается от содержания кадра для того, что бы выйти за его пределы и рассказать о событиях, происходивших до или после момента съемки. Степень выраженности у каждого из воспоминаний признаков двух выделенных типов была оценена по шкале от 1 (минимально) до 5 (максимально). Шкалы были трансформированы в единую шкалу 1–10, где 1 – максимальное присутствие признаков типа А, а 10 – максимальное присутствие признаков типа В. Эксперты не были информированы о замысле исследования, о способе получения текстов воспоминаний и о содержании фотосессии.

Было получено 192 фотографии, 96 фотографий были предъявлены испытуемым и затем включены в процедуру экспертной оценки. В анализ было получено 384 оценки фотографий самими участниками съемки и 672 экспертных оценки.

Анализ полученных данных показал, что сами участники фотосессии не были способны

заметить отличия в своих воспоминаниях, инициированных фотографиями, выполненными в аналоговой или цифровой технологии. Субъективная эквивалентность этих различных по способу опосредствования воспоминаний была нарушена только относительно их эмоциональной насыщенности. Испытуемые оценивали актуализированные с помощью цифровых фотографий воспоминания как более эмоционально насыщенные по сравнению с теми воспоминаниями, которые актуализировались с опорой на аналоговые фотографии (4.04 (1.14) и 3.59 (1.21) соответственно, $F=3.892$, $p=0.05$).

Однако результаты оценивания текстов воспоминаний экспертами оказались кардинально иными. Эксперты согласованно отнесли воспоминания испытуемых, сделанные с опорой на аналоговые фотографии, к типу В, то есть оценили их как истории, содержащие широкое описание развернутого во времени события, преодолевающего границы запечатленного момента, включающего повествование о происходившем до и после съемки (среднее 5.85 (2.98)). Воспоминания испытуемых, сделанные с опорой на цифровые фотографии, напротив, были согласованно отнесены к типу А, то есть оценены как описание мгновения съемки, с подробным описанием компонентов сцены без уточняющей контекстуальной информации (среднее 4.67 (2.9)). Различия между оценками были высоко статистически значимыми ($Z=-5.068$, $p=0.000$).

По результатам проведенного исследования можно заключить, что основное преимущество технологии цифровой фотографии для наивного фотографа – полный контроль над свойствами создаваемого в акте съемки средства для регуляции последующего воспроизведения – препятствует кодированию дополнительной информации в памяти. В результате при актуализации воспоминания с опорой на цифровую фотографию наблюдается редукция тех аспектов воспоминания, которые представляют наибольшую ценность в коммуникативном контексте – исчезают ссылки на целостную историю прошлого события. Воспоминание с опорой на аналоговую фотографию, напротив, связано с актуализацией коммуникативно прозрачной развернутой истории события прошлого.

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ЭЛЕКТРИЧЕСКАЯ АКТИВНОСТЬ КОЖИ И ОЦЕНИВАНИЕ ПРИЛАГАТЕЛЬНЫХ ПО ГЕДОНИСТИЧЕСКОЙ ШКАЛЕ

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Исследование проведено в рамках проблемы соответствия между описаниями поведения с позиции первого и третьего лица (M. Velmans, 1991, p.667; K. Vogeley & G. R. Fink, 2003, p.38). Описание с позиции первого лица (a first-person perspective) основано на доступных человеку ощущениях и переживаниях. Описание с позиции третьего лица (a third-person perspective) – это описание поведения человека, которое может быть дано внешним наблюдателем и разделено с другими наблюдателями. Проверяться гипотеза о соответствии субъективного отчёта о том, насколько приятные или неприятные ощущения возникают у человека, когда он

представляет себя воспринимающим те или иные качества объектов с помощью разных органов чувств, и изменений в электрической активности кожи в ходе этого процесса. Букзайн В. (1994) в своём обзоре работ приходит к выводу, что электрическую активность кожи «следует рассматривать ... как валидный индикатор интенсивности эмоций, особенно негативной валентности» (с. 65).

Методика.

Участники: 23 студента (14 ж и 9 м) в возрасте от 17 до 25 лет (медиана = 18) индивидуально участвовали в исследовании, которое длилось 3 часа.

Прилагательные: по 120 прилагательных для каждого типа ощущений (зрения, слуха, тактильных ощущений, обоняния и вкуса) и 25 тренировочных прилагательных.

Процедура: участник сидел в 50 см от монитора компьютера, перед ним находилась стандартная клавиатура, на которой клавиши «В», «А», «П», «Р», «О», «Л», «Д» были обозначены как «-3», «-2», «-1», «0», «+1», «+2», «+3», соответственно. Эти семь клавиш и клавиша «Пробел» использовались для ответа, обозначения на других клавишах были заклеены белой изолентой.

Участникам предлагалось по 7 балльной шкале от -3 (очень неприятные) до +3 (очень приятные) оценить, насколько приятные или неприятные ощущения у них возникают, когда они представляют себе ситуации, описанные на экране монитора. Каждая ситуация описывалась с помощью одной из следующих 5 фраз и дополняющего фразу прилагательного:

- «Что вы переживаете, когда видите объект»;
- «Что вы переживаете, когда слышите звук»;
- «Что вы переживаете, когда чувствуете запахи»;
- «Что вы переживаете, когда ощущаете вкус»;
- «Что вы переживаете, когда трогаете объект».

В каждой серии на мониторе постоянно предъявлялась одна из фраз, а под ней последовательно предъявлялись 25 соответствующих по типу ощущения прилагательных (первое – тренировочное), при этом клавиша «Пробел» удерживалась нажатой с помощью указательного пальца ведущей руки. После предъявления каждого прилагательного участнику необходимо было вообразить описанное на экране поведение и оценить, насколько приятны или неприятны возникающие при этом ощущения. Длительность предъявления прилагательного составляла 1500 мс. Участнику давалось неограниченное время для ответа.

Для ответа участнику нужно было отпустить клавишу «Пробел» и нажать указательным пальцем одну из клавиш с цифрами от -3 до +3, обозначающую характер возникших у него ощущений. Следующее прилагательное предъявлялось через 5 с после ответа участника на предыдущее прилагательное (то есть после возвращения указательного пальца участника на клавишу «Пробел»). Всего проводилось 25 серий, по пять серий с каждой фразой, порядок предъявления серий был сбалансирован (подробное изложение методики см. Колбенева, Александров, 2010).

Электроды накладывались в начале исследования, после чего участникам предлагали сделать несколько глубоких вдохов. Во время исследования рука участника с наложенными электродами находилась на колене, при этом участника просили не двигать пальцами и

рукой, а также стараться не делать глубоких вдохов.

Регистрация показателей. Электрическая активность кожи измерялась по методу Фере с использованием внешнего источника напряжения порядка 0,9 В. В качестве электродов применялись 2 медных кольца, надеваемых на указательный и безымянный палец неведущей руки. Регистрация проводилась без использования электродной пасты. Площадь электродов 1 см². Частота опроса составляла 8 Гц.

Методики и аппаратура. Регистрация проводилась с помощью прибора, описанного в работах В.Б. Дорохова (Дорохов и др., 2000; Дементенко и др., 1999).

Показатели. Для каждого прилагательного анализировались падения сопротивления кожи, обнаруженные в интервале от начала предъявления прилагательного до предъявления следующего прилагательного. Анализировались только такие падения сопротивления кожи, которые начинались не ранее 125 мс после предъявления прилагательного и длительность падения которых составляла не менее 500 мс. Выбор минимального латентного периода для падения сопротивления кожи обусловлен как частотой опроса (125 мс – вторая точка опроса после предъявления прилагательного), так и предположением о готовности человека к появлению прилагательного, поскольку прилагательные предъявлялись через фиксированный интервал времени после ответа на предыдущее прилагательное. Согласно обзору работ, посвящённых интервалам анализа в исследованиях электрической активности кожи, наиболее распространённой начальной точкой интервала анализа является 1 сек после предъявления стимула, однако в ряде исследований электрическая активность кожи анализировалась от момента предъявления стимула (Levinson & Edelberg, 1985). Падение сопротивления кожи длительностью 500 мс (4 точки опроса) – это минимальная длительность изменений, позволяющая отличить классические волнообразные кривые падения сопротивления кожи от артефактных быстрых изменений уровня сопротивления кожи.

Для каждого прилагательного анализировался ряд параметров первого, а также максимального по амплитуде падений сопротивления кожи: латентный период начала падения, амплитуда, длительность и скорость падения (отношение амплитуды падения к его длительности). Кроме того, для каждого прилагательного подсчитывалось количество падений сопротивления кожи и их суммарная амплитуда в интервале анализа.

Результаты.

1. При сравнении с помощью теста Вилкоксона параметров падений сопротивления кожи для разных гедонистических оценок прилагательных был выявлен эффект интенсивности. Было обнаружено, что чем выше интенсивность приятных или неприятных переживаний, на которую указывают участники при оценивании прилагательных, тем короче латентный период падения сопротивления кожи, выше амплитуда, больше длительность и выше скорость первого и максимального по амплитуде падений сопротивления кожи. Кроме того, выше количество падений и их суммарная амплитуда, а также выше частота появления падений сопротивления кожи, вычисляемая как отношение числа падений сопротивления кожи к сумме этого числа падений и числа случаев отсутствия падений сопротивления кожи при оценивании прилагательных, получивших данную оценку. Эффект интенсивности обнаружен для прилагательных, связанных с разными типами ощущений.

2. При сравнении с помощью теста Вилкоксона параметров падений сопротивления кожи для одинаковых по интенсивности, но противоположных по знаку гедонистических оценок прилагательных был выявлен эффект валентности. Было обнаружено, что при оценивании прилагательных как вызывающих неприятные переживания наблюдаются более высокая амплитуда, длительность и скорость первого и максимального по амплитуде падений сопротивления кожи, чем при оценивании прилагательных как вызывающих приятные переживания. Кроме того, для отрицательных оценок выше суммарная амплитуда и частота появления падений сопротивления кожи. Однако следует отметить, что этот эффект не обнаружен для прилагательных, связанных с обонянием и тактильными ощущениями.

На основании проведённого исследования можно сделать вывод о совпадении субъективного отчёта о гедонистическом тоне испытываемых ощущений при реализации поведения в уме и изменений в электрической активности кожи в ходе этого процесса.

3. При сравнении с помощью теста Вилкоксона параметров падений сопротивления кожи для одинаковых гедонистических оценок прилагательных, связанных с разными типами ощущений, было обнаружено, что оценивание прилагательных, описывающих зрительные ощущения, как вызывающих интенсивные эмоции (оценки «-3», «-2» и «+3»), сопровождается более высокой амплитудой, длительностью и скоростью первого и максимального

по амплитуде падений сопротивления кожи, а также более высокой суммарной амплитудой падений сопротивления кожи, чем аналогичное оценивание прилагательных, связанных с другими типами ощущений. Этот результат противоречит обнаруженному нами ранее (Колбенева, Александров, 2010) эффекту типа ощущений, согласно которому прилагательные, описывающие зрительные ощущения, оцениваются как вызывающие наименее интенсивные эмоции. Одним из возможных объяснений этому может служить эффект редкого предъявления. В предыдущих сериях исследования было показано, что среди прилагательных, описывающих зрительные ощущения, лишь очень небольшое число прилагательных оцениваются как очень приятные или неприятные. Можно предположить, что предъявление таких редких прилагательных сопровождается более выраженными эмоциями, чем предъявление прилагательных, описывающих другие типы ощущений.

Также возможно, что при предъявлении прилагательных, связанных со зрением, актуализируется большое число рано сформированных систем. В структуре индивидуального опыта рано формируемые системы не исчезают при обучении новым поведенческим актам, а происходит «наслоение» новых систем на уже имеющиеся. Представляется, что субъективный отчёт в большей степени отражает активность тех поздно сформированных систем, которые содержат зафиксированные в языке элементы социального опыта, тогда как электрическая активность кожи отражает долю рано сформированных систем в поведении. Поскольку «в ходе выполнения любого поведенческого акта происходит одновременная реализация систем, соответствующих как минимальному, так и максимальному (для данной личности) уровням различия среды» (Alexandrov, 1999, а), а зрение является самым поздно формирующимся, а значит, высоко дифференцированным типом ощущений, прилагательные, связанные со зрением, могут актуализировать все более рано сформированные системы, имеющиеся в индивидуальном опыте, что и приводит к появлению значительных падений сопротивления кожи.

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КОММУНИКАТИВНОЕ ЛИЦЕДЕЙСТВО КАК СПОСОБ РЕАЛИЗАЦИИ РАСПРЕДЕЛЁННОЙ КОГНИЦИИ В ОБЩЕНИИ МАТЕРИ С РЕБЁНКОМ

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Целью проводимого исследования является выявление и описание способов и форм когнитивного взаимодействия матери и ребёнка в повседневном общении.

В качестве теоретической базы исследования выступают основные положения концепции распределённой когнитии, разрабатываемой научным коллективом под руководством профессора С. Коули. В рамках данного подхода когнития рассматривается как процесс, который не ограничен ни структурами мозга, ни человеческим телом, но представляет собой интегрированный во взаимодействие индивидов между собой и с окружающей средой ресурс, тесно связанный с факторами времени и пространства [Cowley, Vallée-Tourangeau 2010: 473]. В классической работе Hutchins 1995 примером, иллюстрирующим, «как работает» распределённая когнития, является описание процесса совместной работы команды корабля, входящего в бухту: когнитивная задача решается путём интеграции различного рода ресурсов, начиная от интерпретации лоцманом показаний навигационных приборов, ряда специальных действий с картой, осуществляемых штурманом, и заканчивая слаженной работой остального экипажа по команде капитана. Ключевым моментом данной когнитивной деятельности является предвосхищение всеми участниками последующих собственных действий и действий других.

Поскольку распределённая когнития основана на феномене совместной деятельности коммуникантов, локализована в контексте аффективных реакций окружающих, в реальном времени и в социально значимом взаимодействии, пространством её актуализации является общение. Важнейшими принципами успешной социальной интеракции являются 1) принцип когнитивных ожиданий и 2) принцип когнитивного предвосхищения [Cowley 2006]. Оба принципа глубоко фундированы в негласных нормах и правилах поведения в той или иной социально значимой ситуации общения в рамках определённого лингвокультурного сообщества, и именно они позволяют распределённой когнитии осуществляться.

Общение матери с ребёнком является наиболее важным пространством формирования когнитивных ожиданий и предвосхищений.

Следует отметить, что общение в диаде «мать-ребёнок» изучается в гуманитарных науках с нескольких основных позиций: во-первых, с точки зрения влияния речи матери на процесс усвоения родного языка (М. Д. Воейкова, В. В. Казаковская, С. Н. Цейтлин); во-вторых, в аспекте особенностей речи матери как особого регистра (A. Fernald, J. B. Gleason, P. Kuhl, L. Menn); и, наконец, в третьих, с целью описания психологических аспектов личности матери (Т. И. Барановская, Е. И. Исенина, М. С. Foley, S. de Sousa Paiva). Однако собственно когнитивные функции общения матери с ребёнком изучены недостаточно.

Материалом для исследования послужили видео- и аудиозаписи речевого общения в 17 коммуникативных парах «мать – ребёнок». Общая длительность записей – 8 часов 30 минут. В 10 коммуникативных парах дети принадлежат возрастной группе от 0 до 1 года, в 7 коммуникативных парах – от 1, 5 до 3 лет. Возраст матерей варьирует от 21 года до 34 лет. Наблюдения обнаружили присутствие в общении мать – ребёнок такого явления, как общение «понарошку». Оно может принимать разнообразные формы – мать разговаривает в присутствии ещё не говорящего ребёнка за себя и за него; мать может говорить за какого-то вымышленного персонажа или игрушку, говорить вместо ребёнка в разговоре с вымышленным взрослым и т. д. Данную разновидность общения матери с ребёнком мы назвали «коммуникативным лицедейством». «Коммуникативное лицедейство» – терминологическое новообразование, предлагаемое нами для обобщённого обозначения широкого круга явлений в общении матери с ребёнком, в которых мать отклоняется от когнитивной роли «я, здесь – и – сейчас действующая/говорящая», занимая другие когнитивно-коммуникативные позиции, описать которые можно, используя коннектор условности *как бы*. Например, нами зафиксирован ряд ситуаций, в которых мать говорит и действует как *как бы* а) ребёнок, разговаривающий с ней самой (*Давай ушки почистим? Не хочешь? Скажи, вот мать издевается: то ей ногти, то ей ушки чистить...*); б) ребёнок, взаимодействующий с другим взрослым (*Кто там? Дядя бж-жи делает? Попроси дядю не делать большие бж-жи. Скажи, не надо, дядя, так делать! Мне не нравится, не нравится*); в) посторонний человек или вымышленный персонаж, разговаривающий с ребёнком (мама говорит «за» куклу: *Здра-авствуй, Ко-остя! Я*

тебе-е пода-арочки привезла); г) мать, но находящаяся в другом эмоциональном состоянии и в другой ситуации, нежели она есть на самом деле, например, понарошку расстроенная мать, хотя она таковой на данный момент не является (Ну, всё. Мама будет плакать – сын не слушает (и начинает изображать плач). Тёма, пожалей маму!); д) другой человек, разговаривающий о данной матери и о данном ребёнке (Мама кашку Антоше наварила, кашку-малашку! (немного позже) Ой, какой мама чаёк сделала с молочком! Допивай пока. Мама кружечку Антоше поможет). В последнем случае мать как бы перевоплощается в постороннего взрослого человека, который видит всю ситуацию общения мамы и ребёнка со стороны, при этом мама использует смещённую референцию, обозначая и себя (чаще), и ребёнка местоимениями 3-го лица или личными именами. Вышеописанные разновидности лицедейства в общении матери с ребёнком были определены нами как «коммуникативные перевёртыши» (а), «коммуникативное суфлёрство» (б), «коммуникативное перевоплощение» (в), «коммуникативное раздвоение» (г) и «коммуникативное дистанцирование» (д).

Мы предполагаем, что все рассмотренные виды коммуникативного лицедейства являются реализацией матерью своего рода когнитивного ритуала инициации в социо-коммуникативную практику в целях своеобразного предвосхищения, «проигрывания» возможных будущих действий в рамках сообщества. В самой онтологически ранней разновидности коммуникативного лицедейства – «коммуникативные перевёртыши» – мать подсознательно демонстрирует

ребёнку модели социального взаимодействия в рамках неделимого ещё коммуникативного целого «мы», как бы ориентируя ребёнка: «так МЫ с ТОБОЙ общаемся». В случае коммуникативного суфлёрства актуализируется модель социальной интеракции «МЫ с тобой разговариваем с чужим (с НИМ)»; в случае коммуникативного раздвоения – модель «Я – здесь, но отдельно от ТЕБЯ»; в коммуникативном дистанцировании используется модель «чужой (ОН) говорит о НАС», при коммуникативном превращении мать обучает ребёнка максимальной автономии, реализуя когнитивную модель «чужой (ОН) разговаривает с ТОБОЙ».

В качестве заключения отметим, что анализ феномена коммуникативного лицедейства позволяет сформулировать ряд выводов:

- 1) когнития, будучи рассмотрена в широком контексте адаптивной деятельности человека, образует тесный симбиоз с коммуникативной деятельностью;
- 2) «коммуникативное лицедейство» представляет собой одну из форм реализации распределённой в социуме когнитии;
- 3) «коммуникативное лицедейство» в общении матери с ребёнком формирует в опыте ребёнка представления-предвосхищения будущих взаимодействий в социальном пространстве Я – ТЫ – МЫ – ОН.

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СВЯЗЬ ПОЛИМОРФИЗМОВ ГЕНА ПЕРЕНОСЧИКА СЕРОТОНИНА С ВОЗРАСТНЫМИ ИЗМЕНЕНИЯМИ АКТИВНОСТИ МОЗГА

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Хорошо известно, что изменения в мозговых структурах и, следовательно, в интеллектуальных функциях происходят с возрастом. Показано, что при старении наблюдается снижение скорости обработки информации (Verhaeghen and Cerella 2008), объема оперативной памяти (Braver and West 2008), способности к обучению и запоминанию новой информации (Old and Naveh-Benjamin 2008). Одним из подходов в изучении изменений мозга, связанных со старением, является картирование фоновой электрической активности,

которая отражает преднастройку мозга к предстоящей деятельности (Klimesch et al. 2006, Вольф и Тарасова 2010). Большое количество электроэнцефалографических исследований возрастных особенностей позволило выделить ряд характеристик изменения мозговой активности при нормальном и патологическом старении.

Поскольку серотонин является нейротрофическим фактором, влияющим на формирование нейрональных сетей (Gould 1999, Djavanian 2004), индуцирует нейрогенез и дифференцировку нейронов, влияет на их миграцию (Haydon et al. 1984, Buznikov et al. 1996), можно ожидать влияние уровня медиатора на процессы старения. Ключевым элементом, регулирующим

функцию серотонинового синапса, является трансмембранный белок-транспортер (5HTT), осуществляющий обратный захват медиатора из синаптической щели. В гене белка-транспортера серотонина человека выявлено два функциональных полиморфных региона. В регуляторном участке гена находится полиморфный сайт 5HTTLPR (5-HTT gene-linked polymorphic region), содержащий 16 (L) или 14 (S) повторяющихся блоков из 22 пар нуклеотидов. Другой полиморфный регион Stin2 VNTR (variable number of tandem repeat in the second intron of 5HTT gene) находится во втором интроне гена и содержит 10 либо 12 tandemных повторов. Короткие аллели характеризуются сниженной экспрессией мРНК и, следовательно, меньшей скоростью инактивации медиатора. Оба полиморфизма были определены как факторы риска для развития различных психических расстройств, таких, как депрессии, тревожность, аддикции (Kuzelova et al. 2010, Gorwood et al. 2000). В настоящее время предполагается, что наибольшее влияние данные полиморфизмы оказывают на образование нервных сетей в эмбриогенезе и дальнейшие их изменения с возрастом (Ansorge et al. 2004; Parsey et al. 2006). Изучение влияния полиморфизмов гена переносчика серотонина на фоновую электрическую активность головного мозга при физиологическом старении может помочь понять его нервные механизмы.

Целью данной работы было выявление ассоциации 5HTT LPR и Stin2 полиморфизмов с возрастными особенностями фоновой ЭЭГ.

В сформированную выборку входили 120 испытуемых старшей (средний возраст $63,94 \pm 6,9$) и младшей (средний возраст $22,42 \pm 2,9$) возрастной групп. Запись ЭЭГ проводилась в состоянии покоя при закрытых глазах в 60 стандартных отведениях системы 10–20. Для каждого отведения методом быстрого преобразования Фурье вычислялась спектральная мощность в индивидуальных диапазонах (Δ , θ , $\alpha 1$, $\alpha 2$, $\alpha 3$, $\beta 1$, $\beta 2$, γ). Так как существуют данные, что возрастные изменения фоновой ЭЭГ выражаются в сглаживании центрo-латерального и фронтo-париетального градиента мощности (Вольф и Глухих 2011), мы провели суммацию мощности ритмов по регионам: передние лобные, лобные, центральные, центрально-височные, височные, теменные и затылочные. Статистическую достоверность результатов проверяли с помощью дисперсионного анализа (ANOVA).

Для 5HTT LPR полиморфизма влияние генотипа было выявлено в $\alpha 2$ - и $\alpha 3$ -диапазонах. У носителей I/I и s/s генотипов происходит снижение мощности ритмов при старении, достигающее

статистической значимости в теменной и затылочной областях. Больше снижение мощности ритмов замечено для гомозигот по s-аллелю. Также была выявлена ассоциация возрастных изменений ЭЭГ и полиморфизма Stin2. Гомозиготы по 12R аллелю старшей возрастной группы имеют меньшую мощность ритмов от Δ до $\beta 1$, а также суммарную мощность ЭЭГ по сравнению с младшей возрастной группой этого генотипа. Наиболее выражены различия в теменной и затылочной областях. Для гомозигот по 10R аллелю характерно снижение мощности ритмов от Δ до $\alpha 3$, достигающее достоверности только в θ -диапазоне, а в $\beta 1$ -диапазоне даже повышение мощности в центральных областях. У гетерозигот замечено снижение мощности медленных ритмов (от Δ до $\alpha 1$) с возрастом, также достоверное только в θ -диапазоне.

Таким образом, наше исследование выявило ассоциацию полиморфизмов гена переносчика серотонина человека с возрастными особенностями фоновой ЭЭГ. Полученные изменения мощности ритмов с возрастом соответствуют представлениям об изменении активности мозга при нормальном старении. Наиболее стабильными показателями мощности отличались гетерозиготы по обоим полиморфизмам, однако соответствует ли это лучшей или худшей сохранности ментальных функций, требует дальнейшего исследования.

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АНАЛИЗ КОГНИТИВНЫХ МЕХАНИЗМОВ ЧТЕНИЯ НА НАЧАЛЬНОМ ЭТАПЕ УСВОЕНИЯ: ВЛИЯНИЕ ПОЛА НА ВЫБОР СТРАТЕГИЙ РЕКОДИРОВАНИЯ

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Изучение механизмов усвоения чтения является в настоящее время весьма активно изучаемой мультидисциплинарной проблемой. В значительной мере это связано не только с академическим интересом, но и высокой социальной значимостью вопроса. По данным разных авторов от 5 до 17% детей в разных странах страдают дислексией – стойкой неспособностью овладеть чтением. В России таких детей – 5%. (Корнев, 1995, Корнев, 2003:1,2). Многочисленные исследования свидетельствуют, что двумя главными показателями сформированности навыка чтения являются точность (accuracy) и беглость, автоматизированность (fluency) (Frost R. 1994:9, Nathan, Stanovitch, 2001:13, Fuchs, 2001:10). Кроссязыковые исследования свидетельствуют, что в разных языках существуют определенные различия в когнитивных механизмах (Frost, 1994:9, Ziegler J.C., Goswami U. 2006: 14). В языках с прозрачной орфографией, с доминированием фонематического принципа письма, к которым относится и русский, ведущим компонентом является беглость, автоматизированность операций декодирования. При овладении чтением в русской письменности ведущей операцией является слогослияние (Корнев А.Н., 2003:2, Kornev, Rahlin, Grigorenko, 2010:12). Основной линией формирования навыка при освоении чтения является постепенное укрупнение оперативных единиц чтения: от отдельных букв к целым словам и группам слов. В качестве механизмов распознавания слов (декодирования) и их семантической идентификации рассматриваются 2 основных стратегии: побуквенное рекодирование

(bottom-up-стратегия) и целостное распознавание графических слов или сублексических единиц (слогов, морфем) (top-down – стратегия) (Coltheart M., 2005:7). На материале русского языка эти механизмы изучены недостаточно. Кроме того, есть основания полагать, что вариативность индивидуальных когнитивных стилей у детей может менять акценты в компонентном составе навыка чтения на начальном этапе усвоения. Здесь представляются уместными параллели с известными данными о типологии стратегий овладения устным языком (Bloom, 1973:4). Известно, что мальчики и девочки овладевают языком в онтогенезе с разной скоростью (Burman et al., 2008:5, Kaiser, 2009:11). Есть данные о разной функциональной организации у мужчин и женщин при запоминании графических слов (Chuansheng Ch, 2007:6). Тяжелые формы дислексии встречаются у мальчиков чаще, чем у девочек (Корнев, 1995: 1, Flannery et al., 2000:8). В отношении качественных различий в освоении навыка чтения русскими детьми данных нет. Целью настоящего исследования был когнитивный анализ основных показателей точности (accuracy) и беглости (fluency) чтения, их взаимосвязей и половых различий между ними.

Экспериментальную группу составили 96 учащихся 2–3 классов общеобразовательной школы Санкт-Петербурга. Средний возраст – 8,87 лет (стандартное отклонение – 0.56). Среди них мальчиков – 56, девочек – 40. Для анализа чтения в исследовании были использованы две методики: Стандартный метод исследования чтения (СМИНЧ, Корнев, 1995:1, Корнев, Ишимова, 2010:3) на материале текстов и русский аналог задания «чтение слов» теста WRAT, включающего 42 слова разной длины и частотности. При чтении текстов СМИНЧ

регистрировались скорость чтения, число ошибок, способ чтения и уровень понимания текста. В тексте «Чтение слов» регистрировались фонологическая правильность (ассурагу), правильность акцентной структуры (постановки ударения) и способ чтения (автоматизированность чтения целым словом – fluency). Суммарная оценка по каждому из параметров зависела от числа слов, прочитанных без ошибок. У всех детей оценивался интеллект посредством Культурно независимого теста Кетелла (CFIT).

Сравнительный анализ частоты ошибок разного типа (фонологических, на ударение и отсутствие автоматизации) показал, что у детей 2 класса отсутствие автоматизации встречалось достоверно чаще, чем фонологические ошибки (Mann-Whitney test $U=841$, $p<0,000$). При сравнении основных параметров «точности» и «беглости» значимых половых различий не обнаружилось. Они выявились в процессе корреляционного и регрессионного анализа. Проведенный корреляционный анализ показал наличие тесных связей между показателями точности и беглости как у мальчиков, так и у девочек. Из 15 потенциально возможных связей 14 у девочек и 12 у мальчиков были сильными и высоко значимыми. В обеих корреляционных матрицах точность и беглость были взаимосвязаны друг с другом. Однако вычисление парциальной корреляции показало, что у девочек почти все связи были обусловлены влиянием переменной «автоматизация» (беглость), а у мальчиков – за счет переменной «ударение». Регрессионный анализ показал, что основной детерминантой у девочек является «автоматизированность синтеза слов из сублексических единиц», а у мальчиков – «правильная постановка ударения». Поскольку ударение является супraseгментарным феноменом, существующим на уровне целого слова, есть основания полагать, что мальчики тяготеют к использованию стратегии распознавания целого графического слова, т.е. используют постлексическую стратегию фонологической реконструкции слова (Frost, 1994:8). Девочки же используют т.н. прелексическую стратегию синтеза целого слова из сублексических единиц (ibid).

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ВЫПОЛНЕНИЕ СЕРИЙНОГО ДВИЖЕНИЯ ПО ЗРИТЕЛЬНОМУ ОБРАЗЦУ: ВЛИЯНИЕ СПОСОБА ПРЕДЪЯВЛЕНИЯ И СЕРИЙНОЙ СЛОЖНОСТИ

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Зависит ли характер внутренней репрезентации серийного движения от того, в какой форме задана информация об этом движении? В какой именно форме – перцептивной, абстрактной или моторной – сохраняется информация в рабочей памяти при отсроченном выполнении серии движений? Для ответа на эти вопросы был проведен эксперимент, в котором испытуемых просили отсроченно воспроизводить траектории различной сложности, предъявляемые тремя разными способами: в виде статического изображения, путем демонстрации процесса рисования траектории (движение курсора, оставляющего след) и путем демонстрации движения курсора, но без видимого следа.

Методика эксперимента. В эксперименте участвовали 16 праворуких (по самоотчету) взрослых испытуемых (20–45 лет), которым предлагалось запоминать предъявляемые на экране монитора плоские фигуры (траектории)

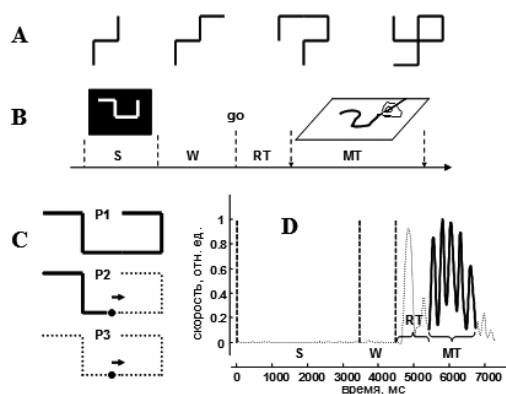


Рис. 1. Методика эксперимента.

A – примеры траекторий; B – структура пробы: S – предъявление траектории, W – пауза, Go – императивный сигнал, RT – время реакции, MT – продолжительность движения; C – способы предъявления траектории: в виде рисунка (P1), в виде рисунка, возникающего в результате движения рабочей точки (P2) и в виде движения рабочей точки, не оставляющей следа (P3); D – пример зависимости скорости от времени на разных этапах пробы (S, W, RT и MT)

и воспроизводить их на графическом планшете. Движение требовалось начинать как можно быстрее после разрешающего сигнала (короткий гудок) и выполнять его возможно быстро, не ухудшая качества воспроизведения и не исправляя ошибок, если они допущены.

Траектории представляли собой ломаные линии, состоящие из горизонтальных и вертикальных отрезков (рис. 1A). Всего использовалось 22 различных траектории, сложность которых определялась числом сегментов (от 3 до 6). Движения записывались с помощью графического планшета (Wacom Intous3), который позволял регистрировать зависимости от времени горизонтальной (x) и вертикальной (y) координат кончика электронного пера с частотой 100 Гц при пространственном разрешении 20 мкм. Эксперимент включал 3 блока по 32 пробы в каждом (всего 96 проб). Проба включала предъявление траектории, паузу в 1 с, в течение которой испытуемый удерживал траекторию в рабочей памяти, и воспроизведение траектории после подачи звукового императивного сигнала (рис. 1B). В каждом из блоков траектории с различным числом сегментов (3, 4, 5 и 6) были показаны каждая по 8 раз в псевдослучайном порядке. Блоки выполнялись в фиксированном порядке и отличались между собой способом предъявления траектории (рис. 1C): в блоке 1 траектория показывалась сразу целиком как статический рисунок (P1); в блоке 2 траектория возникала как след движущейся точки (P2); наконец, в блоке 3 показывалось только движение точки, но не показывался ее след (P3). Анализировались: время реакции RT, определяемое как разность моментов подачи

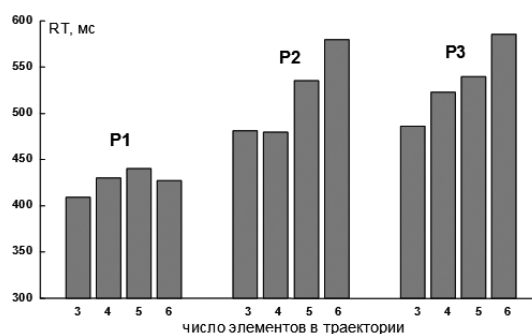


Рис. 2. Зависимость RT от числа сегментов в траектории (3 – 6) для трех способов ее предъявления (P1, P2 и P3)

императивного сигнала и начала движения (соответствует появлению давления пера на планшет); величина МТ – средняя длительность движения вдоль сегмента ломаной траектории (рис.1D).

Результаты и обсуждение. Испытуемые правильно воспроизводили траектории в подавляющем большинстве проб. Средняя частота ошибочных воспроизведений траекторий в режимах предъявления P1, P2 и P3 составила соответственно 2,2%, 1% и 4,6% проб. Ввиду малой частоты ошибок их статистический анализ не проводился.

Время реакции (RT) и время движения (MT) анализировались с помощью многомерного дисперсионного анализа (GLM, multivariate), в котором исследовалось влияние двух внутрииндивидуальных факторов: способа предъявления P (P1, P2, P3) и числа сегментов N (3, 4, 5, 6). Анализ показал наличие значимого главного эффекта фактора P для обоих показателей RT ($F(2,14) = 9.819$, $p = 0.002$) и MT ($F(2,14) = 5.534$, $p = 0.017$). В случае RT значимым оказалось также взаимодействие $P \times N$ ($F(6,10) = 3.676$, $p = 0.034$). Дальнейший анализ показал, что RT при способах предъявления P2 и P3 не отличались значимо друг от друга (518.9 мс и 533.6 мс, соответственно), однако обе эти величины были значимо ($t(15) = 3.532$, $p = 0.003$ и $t(15) = 4.448$, $p < 0.001$, соответственно) больше, чем RT в случае P1 (426.6 мс). Влияние режима предъявления P оказалось значимым для траекторий всех уровней фактора N (уровней сложности). Зависимости RT от способа предъявления указывает на то, что траектории, заданные статически и динамически, хранятся в рабочей памяти в различных формах, а не в единой амодальной абстрактной форме и не в виде готовой к исполнению моторной программы. Этот вывод подкрепляется и взаимодействием факторов

P и N, указывающим, что влияние фактора N на время реакции, известное в литературе (Rhodes et al., 2004) как SLEL (sequence length effect on latency), проявляется только в режимах динамического предъявления P2 и P3, но не в режиме предъявления статического изображения траектории P1. Наличие SLEL в режимах P2 и P3 свидетельствует о том, что процессы подготовки к движению не заканчиваются в период ожидания императивного сигнала, а происходят непосредственно перед выполнением серии движений. Хотя величины МТ практически совпадают в режимах P1 и P2 (269.7 и 275.9 мс соответственно), обе они значимо меньше среднего времени выполнения элемента в режиме P3, составившего 295.3 мс ($t(15) = 2.51$, $p = 0.024$ и $t(15) = 3.13$, $p = 0.007$ соответственно). Этот эффект свидетельствует о том, что, во-первых, преобразование внутренней репрезентации в моторную форму может происходить в процессе выполнения движения и, во-вторых, что при отсутствии статического зрительного образа это преобразование имеет более сложный характер или предполагает дополнительные этапы преобразования информации. Полученные результаты сопоставляются с экспериментальными данными, полученными при исследовании воспроизведения траекторий (Agam et al., 2005; Agam, Sekuler, 2008) и обсуждаются с позиций параллельной CQ-модели внутренней репрезентации последовательности движений (Rhodes et al., 2004; Agam et al., 2010).

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ДИНАМИКА ПРОСТРАНСТВЕННЫХ СПОСОБНОСТЕЙ В ПОДРОСТКОВОМ ВОЗРАСТЕ

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Проблема исследования пространственных способностей включена в общие вопросы, связанные с изучением развития интеллекта и в то же время является самостоятельной, так как содержание пространственных способностей

значительно отличается от каких-либо других. Благодаря Х. Гарднеру (Гарднер, 1983) пространственные способности стали рассматриваться как самостоятельный интеллект, а именно как совокупность способностей к восприятию и манипулированию объектами в уме, способностью создавать зрительно-пространственные композиции. В психологии устоялась точка зрения, согласно которой пространственный интеллект независим от скоростного, измеряемого

групповыми тестами интеллекта (а по некоторым данным – корреляция между ними отрицательная), и, более того, в некоторых исследованиях выявлена отрицательная корреляция пространственных и вербальных способностей.

Пространственные способности традиционно исследуются в контексте половых различий, и в рамках данного направления получены убедительные данные в пользу большей выраженности данных способностей у мужчин (например, Benbow, Stanley, 1980; Виноградова, Семенов, 1993; Schoenfeld, Lehmann, Lepow, 2010). В настоящее время интерес к пространственным способностям обостряется в связи с развитием технологии и методов виртуальной реальности (Glück, Quaiser-Pohl, Neubauer, 2010). Одной из перспективных областей исследований пространственных способностей может быть изучение их возрастной динамики, особенно, что касается подросткового возраста. Это связано с тем, что в интеллектуальной деятельности подростков происходят существенные сдвиги. Основными тенденциями развития при этом являются нарастающая с каждым годом способность к абстрактному мышлению и изменение соотношения между конкретно-образным и абстрактным мышлением в пользу последнего.

Изучение динамики развития пространственных способностей позволит говорить как об особенностях развития конкретных способностей, так и о становлении всей когнитивной сферы в подростковом возрасте. Были выдвинуты следующие гипотезы: 1) на протяжении подросткового возраста происходят изменения в отдельных характеристиках пространственных способностей: по мере развития увеличиваются и абсолютные значения отдельных характеристик и их соотношений; 2) характеристики пространственных способностей, интеллекта и успеваемости по-разному взаимосвязаны в разные периоды подросткового возраста; 3) структура взаимосвязей характеристик пространственных способностей и характеристик интеллекта имеет свою межвозрастную и внутривозрастную специфику.

При организации исследования были совмещены метод поперечных срезов и лонгитюдный метод. В исследовании приняли участие 96 учащихся муниципального образовательного учреждения. В первой точке лонгитюда были привлечены 2 выборки школьников 5 и 7 класс. Затем через два года была сделана вторая точка лонгитюда. На этот момент школьники 5 класса перешли в 7 класс, а семиклассники в 9-й. Подобная организация исследования описана у К. Шайи (цит. по Егорова, 1997). Таким образом,

динамика пространственных способностей рассматривалась на отрезке от 5 к 7 и затем 9 классу. Кроме того, отсутствие различий между первой выборкой 7-классников (вторая точка) и второй выборкой 7-классников (первая точка) позволило предполагать возрастную преемственность от 5 к 9 классу.

Пространственные способности диагностировались по тестам: Тест интеллекта, свободный от влияния культуры Р. Кеттелла (Culture-Fair Intelligence Test, CFIT), Тест Р. Амтхауэра, субтесты 7 и 8 и субтест «Пространственные способности» из тестовой батареи общих способностей DAT (Bennet St.K., Seashore H. St., Wesman A. St.). Использовались три показателя пространственных способностей: 1) общая способность устанавливать отношения (установление пространственных отношений, способность к образному синтезу и способность оперировать в умственном плане трехмерным объектом); 2) способность к образному синтезу; 3) способность представлять и оперировать в умственном плане трехмерным объектом на основе его двухмерного изображения. Диагностика интеллекта осуществлялась на основе Теста вербального интеллекта (ТВИ) Й. Ставела. Результаты были обработаны с помощью методов: t-критерия Стьюдента, коэффициента корреляции Пирсона и факторного анализа.

Основные результаты и выводы сводятся к следующему:

1. У учащихся с 11 до 13 лет происходит развитие образного синтеза и способности устанавливать пространственные отношения (распознавать и продолжать закономерные изменения в серии фигур, переставлять их, определять общие черты). С 13 до 15 лет – развивается умение оперировать в умственном плане трехмерным объектом. На протяжении подросткового возраста с 11 до 15 лет увеличиваются абсолютные значения всех трех характеристик пространственных способностей (установление пространственных отношений, способность к образному синтезу и способность оперировать в умственном плане трехмерным объектом) и их соотношение.

2. В возрасте 11 лет обнаружены отрицательные корреляционные взаимосвязи между академической успеваемостью и умением оперировать в умственном плане трехмерным объектом, способностью устанавливать отношения и умением обобщать материал. При этом положительные корреляции обнаружены для способностей оперировать в умственном плане трехмерным объектом и отдельными характеристиками интеллекта (математическая логика,

выполнение инструкций, практический анализ, исключение, поиск аналогий).

3. Способность к образному синтезу у подростков 11 лет является предиктором способности оперировать в умственном плане трехмерным объектом, а с 13 лет способность оперировать в умственном плане трехмерным объектом увеличивает способность к образному синтезу в 15 лет. Связь показателей образного синтеза в 13 и 15 лет отсутствует. Можно предполагать, что в данном случае обнаружена специфика развития когнитивных способностей, в частности, способности к образному синтезу и способности оперировать объектами являются

4. Начиная с 13 лет, пространственные способности становятся самостоятельным фактором в структуре когнитивных характеристик, в частности, они не имеют корреляционных взаимосвязей с характеристиками интеллекта. Такой факт, конечно, требует дополнительного

изучения, однако можно предполагать, что пространственные способности действительно становятся самостоятельной когнитивной структурой.

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ЕДИНСТВО ИНТЕЛЛЕКТУАЛЬНО–ЛИЧНОСТНОГО ПОТЕНЦИАЛА В РЕГУЛЯЦИИ ПРИНЯТИЯ РЕШЕНИЙ

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Принятие решений (ПР) может опосредоваться разными процессами: эмоциями, использованием схем памяти, размышлением, быть волюнтаристским выбором и т.д. Феноменально выборы субъекта из заданных альтернатив (Decision Making) имеют следующие общие свойства: 1) предполагают приложение человеком определенных усилий – активности по преодолению неопределенности; 2) обратимость рассматриваемых альтернатив по отношению к личностному Я (в противном случае следует говорить о вынужденных выборах либо о постпроизвольной регуляции, а не о ПР). Разрабатываемый нами подход предполагает включенность всего интеллектуально-личностного потенциала человека в психологическую регуляцию ПР (Корнилова и др., 2010). Когнитивные модели выбора фокусируют только один аспект репрезентации ситуации человеку и только один путь регуляции – опосредствованный когнициями (вплоть до уровня метаконтроля). Другой аспект разрыва единства регулятивного профиля ПР – обсуждения личностного выбора вне контекста обращения к познавательной сфере (как будто личностные выборы осуществляет субъект не-вменяемый или не отягощенный разумом).

Длительное время бытовавшее представление о свернутости (симультанности, одноактности) процессов, обеспечивающих ПР, отразилось, в частности, в отсутствии дифференцированной терминологии применительно к идентификации видов и способов психологической регуляции ПР. Они не заданы прямо характеристиками ситуации или альтернатив, более того, и от самого субъекта не зависит часто превалирование тех или иных уровней ориентиров выбора. Сам человек заранее не может знать тех *новообразований*, которые выступают ведущими в соподчинении разных целей, предполагающих побудительно-направляющие и смыслообразующие контексты личностной включенности в ситуацию выбора.

Предположение об *открытости иерархий* процессов регуляции в актуалгенезе ПР стало основой концепции, разрабатываемой нами применительно к ситуациям выбора, требующего мыслительной ориентировки субъекта, и совершаемой как в ситуациях так называемых закрытых задач, так и в ситуациях развертывания многоэтапных интеллектуальных стратегий. При разработке проблемы включенности суждений в ПР сегодня обсуждается весь спектр когнитивных процессов – внимания и памяти, научения и построения умозаключений (Weber, Johnson, 2009). Но по отношению к конкретному выбору можно говорить лишь

о возможной динамике соотношения разных психологических процессов в регулятивном профиле ПР. Такой профиль не может быть жестким кольцом (обратной связи, саморегуляции или др.).

Базирующееся на идее Л.С. Выготского о единстве интеллекта и аффекта представление о динамических иерархиях процессов, опосредствующих выбор, предполагает их идентификацию, которая не является простым делом. Так, Г. Гигеренцер показал, что за регуляцией ПР, связываемой с моральными интуициями, могут стоять свернутые когнитивные структуры (Gigerenzer, 2008). Ранее также на материале юридических решений нами, напротив, было показано, как актуализация личностных отношений может замещать те процессы, которые должны стоять за интеллектуальными выборами, предполагающими использование базовых знаний (Корнилова, 2003). В докладе будут показаны пути взаимодействий когнитивных и личностных переменных, которые могут последовательно раскрываться в исследованиях выбора и деятельности, включающей ПР.

В докладе будут представлены структурные модели, демонстрирующие, в частности, связи между тремя *латентными* переменными – Самооценки интеллекта (СОИ), Внешней

оценки интеллекта (в показателях психометрических тестов и оценок другими людьми) и Принятия неопределенности и риска; СОИ выступила в качестве модератора связи интеллектуальных и личностных характеристик субъекта. На материале вербальных задач будут рассмотрены вклады эмоционального интеллекта, креативности в ПР, а также ряд личностных переменных в качестве предикторов выбора.

Признание *множественности* психологических процессов – как психологической реальности, стоящей за функционально-уровневыми иерархиями регуляции ПР, – требует соотношения разных модельных представлений, раскрывающих пути становления репрезентирующих эти иерархии динамических регулятивных систем.

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ТОЧНОСТЬ РАСПОЗНАВАНИЯ СТИЛЕЙ ЖИВОПИСИ И ОБЩИЕ СПОСОБНОСТИ

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Настоящее исследование выполнено на стыке двух предметных областей: эмпирической когнитивной эстетики и психологии индивидуальных различий. Представляется, что данные области могут быть взаимно обогащающими в раскрытии сущности и роли различных когнитивных процессов в познании субъектом мира в широком понимании.

В современной когнитивной науке велико количество исследований, посвященных различным аспектам переработки эстетической информации (Dudek, 2011). Объекты искусства становятся предметом изучения в связи с особенностями их восприятия, категоризации, эмоциональной оценки (Cupchik et al. 2009). Эстетический опыт вызывает особый интерес

в связи с его гедонической окраской и, соответственно, с когнитивными операциями, для которых характерно самоподкрепление. Существуют теоретические модели, описывающие когниции, обеспечивающие познание объектов искусства. Так, например, модель Г. Ледера с соавт. предлагает стадийное описание процессов переработки эстетической информации: восприятие, имплицитная классификация, эксплицитная классификация, когнитивное совершенствование и оценка (Leder et al. 2004). Выходами модели являются два относительно независимых феномена: эстетическое суждение и эстетическая эмоция. Таким образом, можно говорить о результате рационального, эксплицированного познания и интуитивном восприятии и оценке искусства, связанной с эмоциональным переживанием. С нашей точки зрения, эта дихотомия перекликается с оппозицией логического и интуитивного режимов функционирования психики, сформулированной Я.А. Пономаревым в психологии

мышления, а также с теориями двойственной природы мышления.

Для психологии общих способностей (интеллекта и креативности) оппозиция логического (рационального, конвергентного, эксплицитного) и интуитивного (иррационального, дивергентного, имплицитного) познания является особо важной. Представляется обоснованным мнение, что обе обсуждаемые структуры являясь механизмами функционирования каждой из способностей (Ушаков, Валуева, 2006). Тесты на интеллект предполагают осуществление умственных операций с моделями объектов, итогом чего является нахождение единственного верного решения. Это проявление логической функции. Но вместе с тем в решении интеллектуальных задач имеет место и компонент обнаружения неожиданных, «латентных» свойств объектов. Тесты креативности оцениваются на основе оригинальности ответов, т.е. их неожиданности, отдаленности, что связано с интуитивной функцией.

Выявленная параллель в понимании баланса логического и интуитивного режимов познания в области эстетики и в области предметного мира привела нас к гипотезе о взаимосвязи общих способностей (интеллекта и креативности) и способности к распознаванию стилей изобразительного искусства. Мы выдвинули предположение о том, что точность распознавания стилей неэкспертами будет положительно связана с мерами их креативности как проявления способностей интуитивного плана, но не интеллекта как способностей логического плана.

Было проведено корреляционное исследование ($N=41$, 7 мужчин, студенты, ср. возраст 18,7, ст. откл. 1), в котором оценивались взаимосвязи между показателями общих способностей и точности и скорости распознавания стилей изобразительного искусства, измерявшейся с помощью специально сконструированной методики.

Стимульным материалом методики выступили пары картин, выполненных в стиле импрессионизма, экспрессионизма и модерна. Экспериментальная процедура состояла из двух серий. В первой тестовой серии испытуемым на 1,5 минуты предъявлялось по 9 картин одного стиля (которые обозначались как «стиль 1», «стиль 2», «стиль 3») и предлагалось сформировать впечатление о каждом стиле. После чего начиналась основная серия, в которой испытуемые должны были оценивать, принадлежат ли картины в 36 парах одному стилю. Соответственно, в 18 парах картины принадлежали одному стилю, а в 18 – различным. Испытуемые отвечали нажатием

кнопки, фиксировалось время реакции и точность ответа.

Общие способности измерялись следующими методиками: вербальная креативность (тест отдаленных ассоциаций в адаптации Е. А. Валуевой, Д. В. Ушакова, тест «Необычное использование предмета» Дж. Гилфорда), невербальная креативность (Рисуночный тест творческого мышления К. Урбана), вербальный интеллект (вербальные шкалы теста Р. Амтхауэра), невербальный интеллект (ППМ Равена).

На основании данных, полученных с помощью методики измерения точности распознавания стилей живописи, была сформирована шкала с максимальной внутренней согласованностью (α Кронбаха 0,7), в которую вошли 11 заданий, которые имели точность правильного ответа более 0,64. Большинство заданий, составивших шкалу (9 из 11), содержали картины в одном стиле (ответ «ДА»). Они обладали максимальной дискриминативностью. Шкала для ответов «НЕТ» характеризовалась крайне низкой согласованностью. Это говорит о том, что за сличением картин в этих двух случаях стоят разные когнитивные операции. В случае положительного ответа (картины принадлежат одному стилю) они могут быть проинтерпретированы как интуитивное оценивание, холистическое схватывание конфигурации признаков произведений. В случае отрицательного ответа, вероятно, имеют место разноплановые операции сравнения, тестирования гипотез, что обеспечивает существенную дисперсию результатов.

Непараметрический корреляционный анализ выявил статистически значимые взаимосвязи между точностью распознавания стилей изобразительного искусства и 1) показателем по вербальному тесту Амтхауэра ($r=0,453$, $p<0,01$), 2) показателем по Тесту отдаленных ассоциаций ($r=0,4$, $p<0,05$). Взаимосвязи точности распознавания стилей и показателей невербального интеллекта и креативности (как вербальной, так и невербальной) были не значимы. Был проведен обратный пошаговый множественный регрессионный анализ, в которой зависимой переменной явилась точность распознавания стилей, а независимыми – показатели по тестам вербального и невербального интеллекта и креативности. Наилучшее соответствие эмпирическим данным имеет модель, объясняющая 31% дисперсии, с единственным предиктором – показателем по вербальным шкалам теста Амтхауэра ($\beta=0,552$).

Таким образом, способность к распознаванию стилей изобразительного искусства, вопреки предположениям, оказывается связанной

с мерой кристаллизованного вербального интеллекта, но не с креативностью. Этот факт также может получить интерпретацию в контексте дихотомии логического и интуитивного режимов познания. На сегодняшний день выявлены факты взаимосвязей вербального интеллекта и неосознанной переработки информации. Так, С. Кауфманом с соавт. было показано, что способность к имплицитному научению положительно связана со скоростью переработки и вербальным интеллектом и не связана с фактором *g*, рабочей памятью, способностью к эксплицитному научению (*Kaufman et al., 2010*). Е. В. Гавриловой и Д. В. Ушаковым получены результаты, свидетельствующие о положительной связи между вербальным интеллектом и использованием фокальной и периферийной информации при выполнении творческой вербальной задачи (*Гаврилова,*

Ушаков, 2011, в печати). Данные факты приводят к заключению о взаимосвязи интуиции и продуктивности вербального функционирования. Мы предполагаем, что продуктивность центральных для вербального интеллекта когнитивных операций, конвергентных по своему характеру (суждения по аналогии, обобщения, категоризации), обеспечивается мерой, в которой интуиция является источником формирования кристаллизованного вербального опыта. Кристаллизованный вербальный интеллект основывается как на логическом, так и на интуитивном способе усвоения языковых закономерностей. В этой связи рассмотрение данной взаимосвязи в ее дополнительных измерениях заслуживает дальнейшего пристального внимания.

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МЕТАФОРА В СОВЕТСКОМ ТОТАЛИТАРНОМ ДИСКУРСЕ (ОСНОВНЫЕ МЕТАФОРИЧЕСКИЕ МОДЕЛИ)

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Традиционно метафора понималась как «перенос названия с одного предмета на другой, в чем-то сходный с первым. Метафору нередко образно представляют как зеркало, в котором вне зависимости от чьих-либо симпатий и антипатий отражается национальное сознание, в том числе сущности политической жизни и взаимосвязи различных сфер человеческого бытия [Чудинов 2006: 123].

Метафора не ограничивается одной лишь сферой языка, то есть сферой слов: сами процессы мышления человека в значительной степени метафоричны [Лакофф, Джонсон].

Метафорическая связь основывается на типовых ассоциативных связях по сходству внешних признаков, формы, функции и пр. двух различных денотатов, т.е. основана на сравнении неизвестного с известным, на образности. Метафора – совмещенное представление двух картин, основанная на образных ассоциациях и порождающая их [Бабенко 2008: 63].

В создании метафоры принимают участие две понятийные сферы: сфера-источник (исходная понятийная область) и сфера-мишень (новая понятийная область) [Чудинов 2006: 131].

По мнению Лакоффа и Джонсона, восприятие человеком одной понятийной области через другую понятийную область имеет системный характер, что показано на примере метафоры «спор – это война». Осмысление спора частично в терминах сражения системно обуславливает и саму форму спора, и способ обозначения наших ходов. Поскольку метафорическое понятие системно, системно и язык, используемый для его раскрытия [Лакофф, Джонсон].

Схема связи между понятийными сферами, существующая и/или складывающаяся в сознании носителей языка называется метафорическая модель [Чудинов 2006: 131].

А. П. Чудиновым было выделено и охарактеризовано четыре широких разряда моделей политической метафоры, данные разряды схематично можно представить следующим образом: «Человек как центр мироздания» (антропоморфная метафора), «Человек и природа» (природоморфная метафора), «Человек и общество» (социоморфная метафора), «Человек и результаты его труда» (артефактная метафора) [Чудинов 2006: 136–137].

На основании данной классификации попробуем охарактеризовать наиболее распространенные метафоры советского тоталитарного дискурса.

Социоморфная метафора

1. Милитарная метафора

Сфера-источник «Война»

Фрейм – «Военные действия и вооружение»
Слот «Военные действия»

1) Характерная особенность этого *наступления* состоит в том, что оно уже дало нам ряд решающих *успехов* в основных областях социалистической перестройки (реконструкции) нашего народного хозяйства (Год великого перелома).

2) Отсюда задача партии – взяться вплотную за проблему кадров и *овладеть этой крепостью* во что бы то ни стало (Год великого перелома).

3) Это значит, прежде всего, что *кулак разбит* и лишен орудий и средств производства (Вопросы аграрной политики).

4) *Сломить в открытом бою сопротивление* этого класса и *лишить* его производственных источников существования и развития (свободное пользование земель, орудия производства, аренда, право найма труда и т.д.) (Ликвидация кулачества как класса).

5) Рыков сказал в своей речи неправду, заявив, что генеральная линия у нас одна. Он этим хотел *замаскировать* свою собственную линию, отличную от линии партии (О правом уклоне в ВКП (б)).

2) Фрейм «Действия командного состава»

Они (успехи Советской власти) *вооружают рабочий класс* верой в победу нашего дела. Они подводят к нашей партии новые миллионные резервы (Головокружение от успехов).

2. Артефактная метафора

Сфера-источник – «Сельское хозяйство»

1) Тем досаднее, товарищи, что наши теоретики-аграрники не приняли всех мер к тому, чтобы расчихвостить и *вырвать с корнями* все и всякие буржуазные теории, пытающиеся развенчать завоевания Октябрьской революции и растущее колхозное движение (Вопросы аграрной политики).

2) Существует предрассудок, *культивируемый* буржуазными экономистами (Вопросы аграрной политики).

3) Значение этих вопросов состоит прежде всего в том, что марксистская их разработка дает возможность *выкорчевать с корнями* все и всякие буржуазные теории (Вопросы аграрной политики).

4) Чем создавалось вредительское движение, чем оно *культивировалось*? Обострением

классовой борьбы внутри СССР, наступательной политикой Советской власти в отношении капиталистических элементов города и деревни, сопротивлением этих последних политике Советской власти, сложностью международного положения, трудностями колхозного и совхозного строительства (Новая обстановка – новые задачи хозяйственного строительства).

3. Антропоморфная метафора

Сфера-источник – «Болезнь»

1) Несчастье группы Бухарина в том именно и состоит, что она живёт в прошлом, она не видит характерных особенностей этого нового периода и не понимает необходимости новых приёмов борьбы. Отсюда её *слепота*, растерянность, паника перед трудностями (О правом уклоне в ВКП (б)).

2) Года два назад дело обстояло у нас таким образом, что наиболее квалифицированная часть старой технической интеллигенции была *заражена болезнью вредительства* (Новая обстановка – новые задачи хозяйственного строительства).

3) Чем объяснить, что наши партийные товарищи, несмотря на их опыт борьбы с антисоветскими элементами, несмотря на целый ряд предостерегающих сигналов и предупреждающих указаний, оказались *политически близорукими* перед лицом вредительской и шпионско-диверсионной работы врагов народа? (О недостатках партийной работы и мерах ликвидации троцкистских и иных двурушников).

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СПЕЦИФИЧНОСТЬ МЕХАНИЗМОВ ИНСАЙТНОГО РЕШЕНИЯ: PRO ET CONTRA

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Феномен инсайта как внезапного озарения при решении задач имеет долгую сложную и противоречивую историю изучения. Проблема инсайта в самом общем виде может быть сформулирована таким образом: существуют ли специфические инсайтные механизмы решения, отличающие инсайтное решение от решения комбинаторных задач. С одной стороны, ряд теоретических моделей предполагают наличие гипотетических инсайтных механизмов (Вергеймер, 1987; Дункер, 1965; Кёлер, 1930; Меткэлф, Вибе, 2008 и др.), с другой – ряд современных когнитивных моделей ставят под сомнение специфичность инсайта, вплоть до полного отрицания данного феномена (Weisberg, Alba, 1981).

Главной задачей исследования является разработка и проведение эксперимента по определению наличия или отсутствия специфических инсайтных механизмов. Для осуществления поставленной задачи был определен независимый показатель, который учитывается во всех моделях и доступен объективному исследованию. В качестве такого объективного индикатора впервые предлагается степень загрузки рабочей памяти.

Гипотезой проведенного исследования является предположение о специфичности механизмов решения инсайтных задач. В качестве индикатора динамики мыслительных механизмов выступает загрузка рабочей памяти в ходе решения мыслительных задач. Измерение динамики загрузки рабочей памяти осуществлялась с помощью параллельного выполнения теппинг-теста (испытуемому во время решения основной задачи требуется как можно чаще нажимать на клавишу в течение всего времени решения).

Испытуемым предлагалось выполнить тренировочную и контрольную серии теппинг-теста, а также решить ряд инсайтных и комбинаторных задач при параллельном выполнении теппинг-теста. Пример инсайтной задачи: «Известный экстрасенс мог предсказать счет любого хоккейного матча до его начала. В чем его секрет?». Пример комбинаторной задачи: «65 x 24–541». Все задачи выполнялись устно с использованием метода «мышления вслух» с предъявлением текста задачи на мониторе компьютера. После решения задачи выполнение задания прерывалось. Выборку предварительного исследования составили 10 человек в возрасте от 18 до 23 лет.

В итоге проведенного исследования были получены следующие существенные результаты, описывающие специфику решения инсайтных и комбинаторных задач, которые представлены на графиках динамики загруженности рабочей памяти для трех условий (рис.1.). В силу того, что время решения задач было различно, время решения задач было поделено на 10 равных отрезков, на основе которых возможно сопоставление динамики выполнения заданий. Данные отрезки отражены на оси абсцисс. На оси ординат указано среднее значение времени одного нажатия клавиши (в миллисекундах).

Особо следует отметить следующие результаты:

1. Существуют значимые различия в динамике загруженности рабочей памяти при чистом выполнении моторного теппинг-теста и при параллельном решении мыслительных задач. Это может быть связано с тем, что оба параллельных задания вступают в конфликт за общие ресурсы, а следовательно, идея задания-зонда для изучения динамики механизмов решения задач является приемлемой, методически верной.

2. В результатах наблюдается отсутствие динамики загруженности рабочей памяти при решении инсайтных задач и более высокая продуктивность выполнения дополнительного задания в условии с инсайтными задачами по сравнению с условием решения комбинаторных задач. Видимо, в решении инсайтных задач задействуется в большей степени другой ресурс, не связанный с выполнением теппинг-теста.

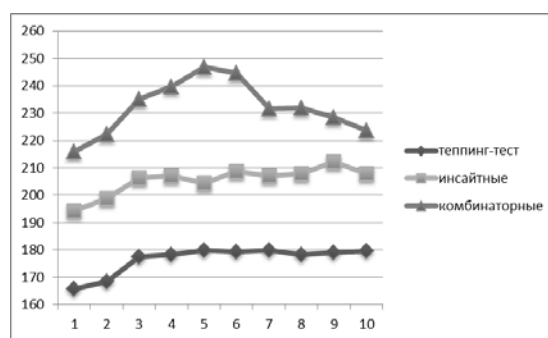


Рисунок 1. Динамика загруженности рабочей памяти при решении мыслительных задач

3. Выявлено наличие динамики загруженности рабочей памяти при решении комбинаторных задач. Следует обратить внимание, что динамика совпадает с результатами, полученными на примере аттенционных заданий (Канеман, 2006), – снижение продуктивности с

последующим повышением. Пики продуктивности связаны со сравнительно малозатратными операциями – чтением условий и вербализацией ответа, а снижение продуктивности в середине решения связано с выполнением комбинаторных операций.

4. Наблюдаются значимые различия в динамике загруженности рабочей памяти при решении инсайтных и комбинаторных задач, которые проявляются как в общих уровнях продуктивности, так и в профилях динамики. Очевидно, что для решения инсайтных и комбинаторных задач используются различные ресурсы рабочей памяти. Различные блоки рабочей памяти могут различаться по типу уровней процессов (для решения инсайтных задач требуются высокоуровневые процессы), либо по типу использования различных репрезентаций (для инсайтных задач в большей степени оказываются важны образная и семантическая репрезентация).

Таким образом, проведенное экспериментальное исследование подтверждает позицию

сторонников идеи специфичности инсайтного решения. По полученным данным, к сожалению, нельзя сделать вывод относительно самих механизмов инсайта. Однако существует возможность найти специфические механизмы инсайта либо в специфических блоках рабочей памяти, либо в иных формах репрезентации информации.

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ОСОБЕННОСТИ КАРТИНЫ МИРА МОЛОДЫХ ЛЮДЕЙ С АУТИСТИЧЕСКИМИ РАССТРОЙСТВАМИ

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Исследование картины мира людей с нарушениями психики представляет большой интерес не только для специальных психологов и коррекционных педагогов, но и для многих специалистов из других областей знания, поскольку помогает понять структуру картины мира у так называемых здоровых людей.

Для изучения картины мира молодых людей с особенностями развития использовался преимущественно метод **включенного наблюдения за подопечными, записи и анализа их высказываний** в рамках работы специализированных ремесленных мастерских, где большое внимание уделялось психолого-педагогическому сопровождению, созданию комфортной среды для учащихся.

Можно отметить следующие особенности картины мира молодых людей с аутистическими расстройствами. Во-первых, это **фрагментарность представлений** об окружающем мире. Нет цельного осмысленного восприятия, что можно объяснить недостаточностью «центрального

связывания» информации (U. Frith, 1989). Знания и впечатления о разных компонентах окружения изолированы друг от друга, плохо соединяясь в единый контекст. При этом известие о связи одного с другим вызывает очень большую радость и удивление («Как же это так получилось?»). Ярким примером может служить эмоциональная реакция на новость о том, что некоторые из педагогов колледжа знакомы с педагогами из других мест, которые посещал подопечный.

Разрозненность впечатлений, недостаточность включения новой информации в контекст уже имеющихся у субъекта знаний и представлений ярко проявляется у наших учеников при проведении с ними учебных занятий. Эта патологическая особенность часто требует трудоемкой (и не всегда успешной) педагогической работы по формированию связей, в частности, межпредметных (например, между уроками математики и черчением в столярной мастерской).

Во-вторых, оказывается, что **некоторые фрагменты мира имеют гораздо большую значимость для сознания аутичного человека, по сравнению с другими**. Очень большое значение для молодых людей часто имеет тема городского транспорта – его маршруты, изменения маршрутов, названия станций – бывшие и нынешние.

Для одного из наблюдаемых нами подопечных особое значение имеют номера телефонов городской телефонной сети. Знания на эти значимые темы, как правило, очень четкие и ясные, особенно по сравнению с явной недостаточностью и размытостью представлений в других областях. Если использовать гештальтпсихологическую терминологию – то аффективно значимые фрагменты картины мира образуют в ней «фигуру», а все остальное – «фон».

Отношения со временем у наших учеников также часто складываются в той же логике. Многие очень давние воспоминания, как правило, также связанные с какими-то аффективными впечатлениями (например, занятия в коррекционном центре, проводившиеся полтора десятка лет назад; общение в лагере десять лет назад с нынешним педагогом колледжа), имеют для этих молодых людей очень большое значение, не меньшее, чем происходящие сейчас события. Эти впечатления являются предметом размышления, фантазирования и обсуждения.

И при обучении в колледже нередко возникают ситуации, когда аутичные ученики при взаимодействии со средой «выцепляют» из нее какие-то отдельные моменты – для обычных людей малозначимые и несущественные, а для них аффективно очень заряженные – и выстраивают отношения со средой, исходя из этих моментов. Так, для одного из наших учеников оказалось достаточным столкновения с необходимостью вытереть стол после работы красками, чтобы уйти «навсегда» из колледжа. Присутствие в сознании каких-то заряженных, «сверхценных» тем неизбежно придает аффективную окрашенность самым, казалось бы, нейтральным событиям окружения. Увидев из окна мастерской машину ГАИ, ученик не может не спросить, не за ним ли едет эта милицмейская машина; чтение рассказа Н. Сладкова «Трясогузкины письма» с группой учеников оказалось невозможным, т.к. аутичный ученик из-за своей «птицебоязни» не мог спокойно слушать этот рассказ. При этом усилия педагога по смягчению этой аффективной заряженности практически всегда не позволяют ее преодолеть: застарелые страхи почти не поддаются прорабатыванию, хотя молодые люди часто радуются даже небольшим шагам вперед в этом направлении.

Наконец, нередко обнаруживается **наивность и незрелость**, в какой-то степени

инфантильность **представлений наших учеников об окружении**, недостаточность их знаний, особенно в области практической жизни. На одном из уроков, например, пришлось обсуждать, стоит ли вызвать «Скорую помощь», если человек слегка порезался. Но особую сложность вызывает понимание социальных отношений. Например, наши ученики нечетко представляют себе, что значит дружить. Часто они неоправданно называют друзьями соучеников и даже педагогов (молодой человек спрашивает у педагога: «А вы со мной дружите?» – явно пытаюсь выяснить, не будет ли педагог в ближайшее время его ругать). Как можно предположить, дружеские отношения представлены в сознании наших учеников как социально желательная ценность, к достижению которой они стремятся. При этом реальные социальные отношения аутичных учеников могут складываться очень специфическим образом. Они, с одной стороны, не сразу дифференцируют и запоминают товарищей по группе, а с другой – часто проявляют нелепые попытки подружиться (погладить, подшутить). Непонимание социальных рамок поведения и негибкое их применение молодыми людьми с аутизмом нередко могут создать у наблюдателя общее впечатление бестактности поведения наших учеников.

Особым образом складываются отношения аутичных людей с **языковой реальностью**. Нередко от них ускользают тонкие смыслы слов, поэтому возникают вопросы: а что значит такое-то выражение (чаще всего затруднения вызывают опять же понятия, связанные с отношениями людей). Наши ученики нередко пытаются сами упорядочить знания о языке, в частности, уточнить, присвоить свои смыслы словам. Нередко речь становится для них значимой, возможной опорой для структурирования ускользающей действительности и регуляции собственных аффектов. Один из наших учеников с очень большим энтузиазмом воспринял выражение «страхи необоснованные» и пытался его применять для борьбы с собственными многочисленными страхами.

Особенности структурирования реальности (нецелостность, фрагментарность восприятия, захваченность аффектом) сказываются на повседневной жизни аутичных людей: в быту, в повседневных социальных ситуациях, при обучении ремеслу.

ИНТЕЛЛЕКТУАЛЬНЫЙ ПОТЕНЦИАЛ: ОПЕРАЦИОНАЛИЗАЦИЯ И СИНЕРГИЯ РЕСУРСОВ

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Приращивает ли человечество свой интеллектуальный потенциал? Осуществляется ли когнитивная эволюция? Интеллектуальнее ли современный человек по сравнению со своими историческими предшественниками? Все эти вопросы одного порядка и в современной экспериментальной психологии операционализируются в форме измеряемых или наблюдаемых параметров, которые можно зафиксировать и оценить размер их прироста или снижения.

Наиболее ясным примером прироста интеллектуального потенциала человечества является эффект Флинна (Flynn, 1984). За период чуть более ста лет развития психометрических исследований удалось накопить разнообразные данные, демонстрирующие, что последующие поколения приращивают интеллект относительно предыдущих поколений по показателям IQ (коэффициента умственного развития). Как показывает ряд обзоров, наиболее систематические результаты получены по изменению интеллекта в США, свидетельствующие, например, что с 1910 до 1984 г. показатели интеллекта по тестам типа Стэнфорд-Бине выросли на 22 балла. Аналогичные результаты получены по Западной Европе в двадцатом столетии при сравнении довоенных и послевоенных результатов (Бельгия 1940–1949 гг., Франция 1931–1956 гг., Нидерланды 1934–1964 гг.). Мощный рост интеллекта был зафиксирован в послевоенной Японии, причём японские дети по показателям тестов IQ начали превосходить своих американских сверстников (обзор Д. В. Ушакова, 2004). В современном мире эта тенденция роста значений показателя IQ усиливается, особенно по данным азиатского региона. Например, отмечен экспоненциальный рост грамотности и показателей тестов IQ суммарно по Индонезии, Пакистану, Бангладеш и Филиппинам (с учетом не особой развитости психометрической науки), не говоря уже о Китае и Японии, где производятся надежные психометрические исследования. При этом эффект Флинна в Азии связывают с экономическим ростом, формированием среднего класса в странах Азии. На основе эффекта Флинна и того, что минимальный уровень показателя интеллекта IQ должен составлять 130 единиц как

минимальный порог, необходимый, чтобы получить научную степень (Ph. D.), прогнозируется, что к 2050 году Европа с Америкой будут иметь приблизительно 19 миллионов способных к науке людей, принимая во внимание, что, эффект Флинна усиливается ростом населения, Азия будет иметь приблизительно 147 миллионов способного к науке населения (Miller, 2006). В России эффект Флинна также имеет место (Григорьев А. А., 2010), но с учетом сложной демографической ситуации сложно предположить, какое количество способного к науке населения будет в России к 2050 г.

Эффект Флинна подтверждён с использованием различных тестов на интеллект – теста Векслера и версий прогрессивных матриц Равена на выборках 1975, 1977, 1979 и 1981 годов рождения в Нидерландах и в Эстонии (Must, Must, & Raudik, 2003; te Nijenhuis, van der Flier, 2007). Интересны находки американских исследователей (Sanborn, Truscott, Phelps & McDougal, 2003), обнаруживших эффект Флинна для детей с IQ 95–105 единиц, классифицирующихся как неспособных к обучению (learning disabled, это дети с когнитивными проблемами, например, с дислексией или дисграфией, гиперактивностью и т. п.). Выявленный прирост в значениях IQ у лиц с низким интеллектом также является важным показателем того, что общий интеллектуальный потенциал человечества усиливается. Лонгитюдные измерения на разных возрастных группах, сделанные австралийскими психологами, позволили прийти к заключению, что эффект Флинна характерен только для молодёжи и теряется при измерениях на более старших возрастных когортах (Nettelbeck, T., & Wilson, 2003), что, по мнению авторов исследования, указывает на проблемы интеллектуального прироста в динамике индивидуальной жизни и на слабую надёжность IQ предиктора и биологического маркера сохранности когнитивной продуктивности в старости.

В целом, глобальное сообщество приращивает интеллект, по крайней мере, по измеряемым показателям коэффициента умственного развития – IQ, несмотря на социо-географические, возрастные и индивидуальные различия. Также, несмотря на то, что сохраняются закономерности колоколообразной кривой распределения интеллекта, которые делят общество на интеллектуалов и неинтеллектуалов (Hunt and Madhyastha, 2008), происходит повышение значений общего уровня интеллектуального

развития, как для обладателей сниженного интеллекта, так и для среднего и высокого уровня.

Усиление человеческого интеллекта фиксируется и в системе тестирования знаний, разработанной и развивающейся в современном образовании для оценки его качества по параметрам академической компетентности. В результате лонгитюдных исследований обнаруживается та же самая, что и по уровню интеллектуального развития (IQ), тенденция повышения уровня значений выполнения тестов, например, таких, как SAT (The Scholastic Achievement Test), от предыдущего поколения к последующему. Обнаружен прирост по вербальной части теста от 700 до 750 в 2004 году по сравнению с результатом от 640 до 690 в 1996 году. Среди 22 учреждений, которые сообщили о результатах выполнения математической части SAT, пропорция абитуриентов с результатом более чем в 700 баллов, которые поступили в 1989 году и в 2007 году, поднялась в среднем на 25 процентов (Schmidt, 2008). Также проявляется тенденция роста тестовых баллов в показателях академического теста Graduate Record Exam (GRE) по экономике при наличии гендерных различий в пользу мужчин (данные 1989–1995 гг., Hirschfeld, Moore, Brown, 1995).

Особые успехи в результатах академических тестов отмечены для азиатов детского и юношеского возраста, иммигрировавших в США и Европу, поколения, родившегося за пределами азиатского континента, эта категория значительно опережает белых сверстников по результатам тестов в математике, тестов вербальных навыков, как на уровне школы, так и в колледже (Tan,

1994; Zhang, 2003). Усиление интеллектуального потенциала по измеряемым тестами параметрам академической компетентности, безусловно, связано с новыми возможностями экстенсивной ассимиляции разнообразного культурного опыта, обеспеченной мобильностью населения, развивающейся системой глобального образования. В общей динамике за годы применения тестов интеллекта (IQ, примерно с 1914 года) и тестов учебных способностей (например, SAT, с 1926 года утверждён Комитетом колледжей по вступительным экзаменам), установлено, что повышается не только уровень общего интеллектуального развития, традиционно измеряемый IQ-тестами, но и академическая компетентность от одного поколения к другому.

С позиций концепции человеческого потенциала важно рассмотреть результаты накопленных эмпирических данных как два разных типа ресурса, которые могут иметь разное соотношение в зависимости от опыта образования, когнитивного фона развития и социальной ситуации в обществе, от возраста и генетических особенностей человека, — это академический ресурс (измеряемый тестами знаний) и собственно интеллектуальный ресурс (измеряемый IQ-тестами и другими когнитивными методиками). Такое понимание сложения ресурсов разного типа в один интеллектуальный потенциал продуктивно для эмпирических исследований, особенно для объяснения противоречивых корреляционных эффектов между интеллектом и разного рода достижениями.

МОДЕЛЬ ВЕКТОРНОГО ИНТЕЛЛЕКТА В ИННОВАЦИОННОЙ ДЕЯТЕЛЬНОСТИ

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Для повышения интеллектуального капитала (ИК) творческих групп и организаций предлагается векторная модель коллективного интеллекта с доминантой эмоционального интеллекта в процессах инновационной деятельности.

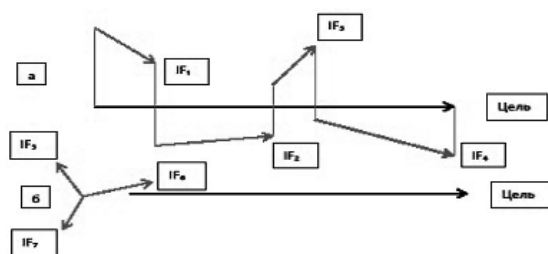
Общий интеллект человека, группы людей, организованного сообщества, например, лаборатории, характеризуется, как и всякий вектор,

абсолютной величиной — числом и направлением. Поэтому правильнее говорить не «коэффициент интеллекта» — IQ, а «сила интеллекта» — IF, так как по определению любой коэффициент представляет собой безразмерную величину — число, которое не имеет направления.

В понятие «эмоциональный интеллект» — EQ разные авторы вкладывают несколько отличающиеся смыслы (Mayer J. D., Salovey, P., 1990, Андреева И. Н., 2006 и др.), с учетом которых можно дать следующее определение: восприятие, понимание и управление как своими, так и чужими эмоциями в целях повышения эффективности генерации новых знаний с помощью эмоций. В парадигме векторного общего интеллекта эмоциональный интеллект можно

представить в виде среды, обладающей свойствами селективной проводимости в определенных направлениях. В виде среды, которая может менять свою структуру или фазовое состояние, например, переходя в состояние сверхпроводимости. Наделяя эмоциональный интеллект такими свойствами, приходим к понятию конденсированной интеллектуальной среды, обладающей, как уже отмечалось, селективностью проводимости генерируемых знаний. В такой среде $IF = \eta EQ$, где η – коэффициент селективной проводимости конденсированной интеллектуальной среды, зависящий от направления вектора IF . При изменении фазового состояния интеллектуальной среды возможны скачкообразные изменения её свойств.

Модель общего IF организованной группы представляет собой векторную сумму интеллектов его членов $\sum IF$, в которой учитывается степень ориентации интеллекта на решение задач, стоящих перед этим коллективом для достижения поставленной цели. $\sum IF$ зависит от точки приложения и направления действия, может быть как созидающим (см. рис. а), так и разрушающим или неэффективным (б), как, например, действия «лебедя, рака да щуки» в известной басне И. А. Крылова.



Для инновационного предпринимательства важным элементом ИК является интеллект, материализованный в патенты и лицензии, товарные знаки и полезные модели, технические регламенты и многое другое, для органов власти – эффективно работающие законодательные и нормативные акты, каналы взаимодействия с вышестоящими и нижестоящими органами власти, бизнес-сообществом и некоммерческими организациями. В понятие «интеллектуальный капитал организации», кроме материализованных форм ИК, входят накопленный положительный опыт сетевого взаимодействия организации, как с внешней средой, так и сотрудников и подразделений внутри нее самой. В этой связи плохо прописанные законы и нормативные акты есть не что иное, как интеллект, направленный не на созидание, а на консервацию, торможение или даже разрушение ИК организации.

Модернизация и инновационная деятельность предполагает создание и использование органами власти законодательных и нормативных актов, оптимизирующих деятельность хозяйствующих субъектов, сокращающих расходы предприятий и организаций, повышающих качество жизни населения.

При использовании EQ речь может идти не только и не столько о повышении эффективности мышления, а в первую очередь – о синергетике интеллектуальной деятельности человека либо творческой группы людей. В это понятие мы вкладываем открывающиеся принципиально новые возможности интеллектуальной деятельности, вызванные сформированной конденсированной интеллектуальной средой эмоционального состояния, которая стимулирует поиск оригинальных решений.

Сегодня никого не удивляет повышение (снижение) физического тонуса под воздействием эмоций. Типичным примером может быть игра хоккеистов России в матче с канадцами на зимних олимпийских играх в Ванкувере в феврале 2010 года, когда явно были видны признаки эмоционального диссонанса российских игроков, находившихся, по утверждению тренеров сборной команды, в прекрасной физической кондиции. Однако эмоциональное состояние не позволило реализовать физические возможности команды скоростной и эффективной игры. Управляя эмоциями, можно реализовать физические и интеллектуальные возможности человека. Эмоциональная интеллектуальная деятельность группы новаторов и интеллектуальная – это два процесса, способные дать синергетический эффект, как в эмоциональной, так и интеллектуальной деятельности, величина которого определяется фазовым состоянием эмоционального интеллектуального поля.

Можно провести следующую параллель. Произведения искусства могут быть холодными, выполненными тонко, высокопрофессионально, а могут быть душевными, наполненными человеческим теплом. Если в первом случае зритель обращает внимание на краски, технику исполнения и прочие поддающиеся логическому анализу внешние атрибуты и получает удовольствие, то во втором – он благоговеет, созерцая полотно, испытывая сильное эмоциональное потрясение, проникает в суть произведения.

Любое описание технологического процесса либо управленческой ситуации ценно настолько, насколько тонко и полно оно передает реальную картину процесса или жизненную ситуацию, причем в большинстве случаев задача

изначально представляется некорректной ввиду недостатка начальных условий. Но в этой незавершенности картины, напоминающей полотно импрессионистов, может находиться побудительный мотив к «озарительному творчеству» позволяющему найти новое техническое или управленческое решение, найти нетрадиционные пути развития процессов.

В частности, полотна Клода Моне с его эмоциональным восприятием окружающей среды можно отождествлять с представлениями исследователя, инноватора о создаваемом изделии

или разрабатываемой технологии, так как они очень точно передают ощущения изобретателя, который, начиная с определенного момента решения технической (технологической) задачи, начинает видеть все ее тонкие черты также зримо, как проступает тонко воздух Парижа в произведениях импрессионистов.

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АНАЛИЗ КОММУНИКАТИВНЫХ СТИМУЛОВ В КОРПУСЕ ЭМОЦИОНАЛЬНЫХ ДИАЛОГОВ

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Коммуникативный стимул заставляет человека прервать молчание и вступить в коммуникацию; таким образом, этот механизм связывает внутренние процессы мышления и синтеза речи с внешними процессами поведения, социального взаимодействия и коммуникации. Поэтому задача описать природу и механизмы коммуникативных стимулов стоит перед самыми разными науками: лингвистикой, психологией, этологией, исследованиями в области искусственного интеллекта и т.д. Традиционно каждая из этих областей рассматривала процесс вступления в коммуникацию со своей точки зрения, не обращаясь к материалам смежных наук, однако возникновение ряда практических задач делает интеграцию научных знаний необходимой. Во-первых, это задача формального моделирования поведения человека. В поведении человека статистические методы позволяют выделить паттерны, которые для некоторых ситуаций позволяют описать по времени до 100% поведения (Magnusson, 2008). Во-вторых, проработанный механизм имитации поведения и коммуникации необходим для создания автоматических систем поддержания диалога и компьютерных агентов, которые могли бы правдоподобно себя вести и поддерживать диалог с человеком (Cassell, Sullivan et al., 2000). Если ранее от таких систем требовалось только отвечать на запросы пользователя, например, поддерживать диалог в телефонной справочной службе (Кибрик, А.Е., 1992: 301–323), то сейчас к ним предъявляется требование непрерывно анимировать мобильного робота или компьютерного персонажа,

спонтанно вступать в коммуникацию, обращаться к пользователю (Котов, 2010).

Для описания речи и поведения человека создаются *корпуса* – большие коллекции текстов, сопровождаемых разметкой. Разметка содержит грамматическую информацию для каждой словоформы и информацию о синтаксической структуре предложения. Для анализа интонации, для разработки систем синтеза и анализа речи создаются аудиокорпуса устной речи (Кибрик А. А., Подлесская, 2009; Маркасова, Воробьева, 2010), а для анализа движений тела, мимики и жестов – мультимодальные корпуса, включающие видео- и аудиозапись действий человека.

Мы работаем над проектом Русскоязычного эмоционального корпуса (REC), который на данный момент включает 295 записей диалогов на устных экзаменах в университетах и 510 обращений в службу одного окна по вопросам оплаты коммунальных платежей. Ранее мы разметили в этом корпусе основные мимические действия (движения глаз и рта) и действия, выполняемые руками.

Наша текущая задача состояла в том, чтобы выделить в корпусе высказывания и разметить коммуникативные стимулы (или цели), которые привели к их появлению в речи информантов. Спонтанная речь состоит из множества неполных фрагментов, что затрудняет её анализ. Кроме того, внутренний стимул может не соответствовать поверхностной форме выражения. По этим причинам мы проводим разметку на нескольких уровнях (строках):

а) Разметка структуры высказывания. При синтезе речи говорящий может начать свою речь с междометия, затем объявить тему высказывания, начать с нескольких незавершенных фрагментов, наконец, построить «законченный»

фрагмент высказывания и при неуверенности – дополнить уже построенное высказывание. Для каждого отдельного фрагмента речи мы выделяем его функцию в общем высказывании. Мы предполагаем, что исходный коммуникативный стимул «расщепляется» и влияет как на синтез основных частей высказывания, так и на синтез междометий, зачинов и дополнений к ядерной части высказывания.

б) Разметка иллокутивных целей (ИЦ). Классический инвентарь иллокутивных целей описывает действия, совершаемые говорящим при произнесении высказывания (Остин, 1999). Иллокутивные цели позволяют разделять: передачу информации (ассертивная ИЦ), указание (директивная ИЦ), обещание (комиссивная ИЦ), выражение эмоций (эмотивная ИЦ) и т.д. При разметке мы дополняем классический набор иллокутивных целей разметкой для вопросов, согласия, возражения, коррекций и хезитации (всего 16 коммуникативных целей).

в) Разметка стратегий вежливости. В рамках теории вежливости считается, что участники коммуникации регулярно выполняют «действия, затрагивающие лицо» собеседника (Brown, Levinson, 1987). Например, в ситуации просьбы говорящий «командует» адресатом, тем самым задевая его социальное лицо. Чтобы этого избежать, говорящий модифицирует в речи свою просьбу, делая её менее категоричной (*Можно тебя на секундочку?*). В этом случае отдельная стратегия вежливости (здесь: преуменьшение ущерба) реализована внутри высказывания, но задача выразить стратегию вежливости может привести к построению отдельных высказываний. Адресант сначала выскажет просьбу, а затем может представить объяснения, мотивировки, ссылки на то, что это соответствует обычной практике (*Вообще, в нашем деканате такое практикуется!*). Для этой строки используется 21 ярлык разметки.

г) Разметка эмоциональных событий. Жест, речевая или мимическая реакция могут быть реакцией на входящее событие. Таким событием может быть входящее высказывание

(входящий «вопрос» может повлечь «ответ») или событие реального мира (например, неудача при выполнении действия). Данная строка разметки введена в корпус для учёта важных событий, которые проявляются в речи. В результате мы можем отобрать контексты типа «реакция на неудачу», «реакция на успех», «реакция на входящее поручение», «подготовка к выполнению важного действия» и т.д. – и рассмотреть реакции информантов в этих ситуациях (7 ярлыков разметки).

Корпус позволяет выделять мимические паттерны, характерные для тех или иных коммуникативных целей (например, информанты морщат нос, представляя свою просьбу как соответствующую обычной практике). Корпус позволяет соотносить глубинные цели (просьбы, переживания неудачи и т.д.) и более поверхностные иллокутивные цели (просьба может быть оформлена как вопрос). Корпус также позволяет анализировать длинные паттерны коммуникативного поведения, где исходное событие – просьба или переживание – окружается набором сопутствующих высказываний, мимических и жестовых выражений.

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КОГНИТИВНОЕ ОБЕСПЕЧЕНИЕ КОММУНИКАТИВНОГО ПРОЦЕССА В НОРМЕ И ПРИ ШИЗОФРЕНИИ

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Социальное познание – особая реальность познавательной деятельности человека: исследования представлений о психике другого, организации коммуникации, распознавания намерений другого человека (Gergely с соавт.,

Показатели особенностей кооперативного мышления	Психически здоровые испытуемые, % правильных ответов	Испытуемые с диагнозом «шизофрения», % правильных ответов	X ²	p
анимирование (выбор)	96,00%	48,28%	14,6	0,000
совместное внимание	100,00%	84,00%	0,77	0,530
удержание совместного опыта	96,00%	46,15%	15,7	0,000
коммуникативное намерение (по названию)	84,00%	79,31%	0,2	0,460
коммуникативное намерение (по факту)	92,00%	68,97%	4,39	0,370

Таблица 1. Особенности кооперативного мышления у психически здоровых испытуемых и испытуемых с диагнозом «шизофрения».

2002; Meltzoff, 1995; Carpenter, Call и Tomasello, 2005) показывают, наряду со спецификой этого познания, его особую роль в организации активности человека в целом.

К примеру, для такой целостной, затрагивающей функционирование всей психики, патологии, как шизофрения, первичным считается дефицит мышления и эмоций (Блейхер, 2002; Сидоров, Парняков, 2001). Но есть множество указаний на то, что этот первичный дефицит спровоцирован проблемами с общением у этих больных (Поляков, 1991; Ганнушкин, 2007). Однако в литературе практически нет четких указаний на то, какие именно особенности общения оказываются нарушенными. Эти нарушения отличимы от трудностей общения психологического генеза (Блейхер, 2002), а также от речевых трудностей (Поляков, 1991).

Эти различия приводят нас к мысли о том, что источники специфического для шизофрении характера нарушения общения необходимо искать в структуре так называемого кооперативного мышления (Томазелло, 2008). Томазелло описывает его как умение целенаправленно организовывать коммуникацию и контролировать ее протекание. Мы выделили в его работе 4 особенности, которые можно было бы считать подразумеваемой Томазелло структурой кооперативного мышления, и сравнили их выраженность у больных шизофренией и психически здоровых испытуемых.

Для фиксации каждой из особенностей нами были разработаны задания.

Интерпретация событий с точки зрения намерений участников (анимирование) – испытуемым демонстрировался мультфильм, в котором одна геометрическая фигура «предпринимала попытки залезть» на холм, другая фигура «сталкивала» ее, а третья «помогала» ей залезть, и такая интерпретация задавалась исключительно передвижениями фигур; затем испытуемым предлагали выбрать продолжение мультфильма из двух, в одном из которых

«залезающая» фигура «выбирала» движение к «мешавшей», а в другом – к «помогавшей», что говорило нам о том, приписывал ли испытуемый геометрическим фигурам «намерения» (Аналогичная методика см. в работе Kuhlmeier, Wynn, Bloom (2003)).

Удержание совместного внимания – испытуемым предъявлялось изображение персонажа (молодого человека или девушки), рядом с начатой «башней» (4 плоскими элементами, расположенными друг на друга) и двумя элементами в нижней части рисунка, плоским и неплоским; затем сообщали: «Представьте себе, что этот человек говорит вам: «Я строю башню. Поддай мне то, что подойдет». Выберите то, что подошло бы ему». По выбору из двух элементов внизу рисунка мы решали, может ли испытуемый понимать, на что направлено внимание другого человека и разделять это внимание. Аналогичное задание давалось дважды.

Удержание совместного опыта – испытуемым предъявлялось изображение того же персонажа, что и в предыдущем задании, но выглядывающего из-за ширмы, без «башни» рядом, но с 2 элементами на выбор в нижней части рисунка. Указывая на них, говорили: «Теперь этот человек говорит: «Я продолжаю, поддай мне то, что подойдет» Выберите то, что подошло бы ему». По тому, задавал ли испытуемый вопросы про то, что имеет в виду персонаж, мы заключали, удерживает ли испытуемый факт совместного опыта с персонажем.

Понимание коммуникативного намерения – испытуемому показывали 2 искусственных объекта и про один из них сообщали его искусственное название; затем испытуемого просили подать нечто, называя другое искусственное название. По тому, какому объекту испытуемый атрибутировал это название – названному в первый раз, или не названному, мы решали, рассматривает ли испытуемый наименование преднамеренной коммуникацией (Аналогичная методика см. в работе Clark, 1978).

Из выбранных нами особенностей кооперативного мышления значимые различия между психически здоровыми испытуемыми и испытуемыми с шизофренией были обнаружены только для интерпретации событий с точки зрения намерений участников и удержания совместного опыта и не были обнаружены для удержания

совместного внимания и для понимания коммуникативного намерения.

Мы полагаем, что это говорит о том, что при шизофрении в первую очередь нарушается возможность выстраивать коммуникацию без опоры на непосредственно воспринимаемые коммуникативные сигналы.

ВЛИЯНИЕ ВЕРБАЛИЗАЦИИ ЗНАКА НА УСПЕШНОСТЬ ФОРМИРОВАНИЯ НОВЫХ КАТЕГОРИЙ С РАЗЛИЧНОЙ СТРУКТУРОЙ

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Во многих исследованиях было показано, что простое присутствие знака существенно улучшает формирование новых категорий (обз. по теме см. Luryan et al., 2007). Также известно, что роль знака не сводится лишь к функции обратной связи. Знак помогает управлению вниманием при анализе признаков объекта (Sloutsky, 2010); усиливает ожидания, что объекты с одним знаком относятся к одной категории (Waxman, Markow, 1995); позволяет индивидуализировать объекты в памяти (Xu, 2002).

Однако в настоящее время существует мало данных о том, какие именно свойства знаков помогают формированию категорий. Знак, с одной стороны, имеет множество визуальных особенностей, которые делают его удобным средством для обобщения: он перцептивно отличим от объекта и привлекает внимание, коррелируя с появлением объекта. С другой стороны, знаки часто имеют вербальную форму, что также обеспечивает ряд возможностей: их легко запоминать, связывая с другими знаками-словами; повторять про себя и с помощью них можно общаться с другими людьми. Какие из свойств знака – перцептивные или вербальные – имеют большее значение для формирования категорий?

Недавние обобщения в психологии понятий показали, что имеются существенные отличия в механизмах формирования категорий в зависимости от их структуры (Sloutsky, 2010). Так, принято отличать статистически-плотные категории (приводящие к образованию обобщений по принципу семейного сходства) и статистически-неплотные (обобщения по принципу правила с одним признаком). Доказано, что формирование статистически-плотных категорий в онтогенезе происходит раньше, чем

формирование статистически-неплотных и, кроме того, может происходить без участия речи и функции контроля (executive function).

Мы предположили, что зависимость формирования категорий от знака будет разной для разных типов категорий. Так, для статистически-плотных категорий более удобным будет не вербальный знак (слово), а знак в виде визуального образа. Для статистически-неплотных категорий – наоборот, более удобным будет вербальный знак. Это различие обусловлено тем, что для статистически-плотных категорий важнее создание перцептивной группировки признаков, которая считается нетребовательной к обратной связи, поэтому перцептивные свойства знака будут легче связываться с другими подобными им свойствами объекта. Для статистически-неплотных категорий важнее сфокусированное внимание на небольшой части признаков объекта и существует зависимость от обратной связи, поэтому перцептивные свойства знака могут отвлекать от перцептивных свойств объекта, в то время как вербальная форма знака помогает дистанцироваться от них.

Для проверки этой гипотезы мы создали два набора объектов с одинаковым составом признаков. Это были искусственные объекты, напоминающие стрекоз. Каждый объект имел пять признаков, которые варьировались по двум значениям. Например, были стрекозы с длинными крыльями и короткими. Один набор был составлен так, что признак, отделяющий две категории, был лишь один, например, длина крыльев. Этот набор создавал статистически-неплотную категорию. Второй набор составляли объекты, которые отличались друг от друга по нескольким признакам, и ни один признак не был решающим. Объект относился к категории на основании четырех из пяти признаков. Этот набор задавал статистически-плотную категорию.

Испытуемые проходили процедуру формирования категории с обратной связью, то есть

после каждого их предположения о том, к какой категории относился объект, они получали правильный ответ в виде знака этой категории. Мы варьировали вид знака. Вербальным знаком было слово – два названия для двух категорий («император» и «красавица»). Невербальным знаком были две картинки со стилизованным изображением стрекозы одинаковой формы, но разного цвета – зеленого и красного.

Испытуемые видели объект в течение 1500 мс и потом отвечали, нажимая на одну из двух кнопок. Перед объектом и после него предъявлялось маскирующее изображение. Всего было 10 объектов – по пять в каждой категории. Каждый испытуемый проходил шесть тренировочных серий, в каждой из которых последовательность объектов была рандомизирована. Зависимой переменной была общая успешность категоризации объектов в серии. Мы использовали смешанный факторный план 2х2х6 (межсубъектный – две структуры категории и две формы знака, внутрисубъектный – шесть тренировочных серий).

Для статистически-плотных категорий мы обнаружили зависимость успешности формирования категории от формы знака: более высокая успешность была при использовании визуальных знаков, а более низкая – вербальных знаков, $F=8.45$, $p<0.01$, $\eta_p^2=0.32$. Однако в статистически-неплотных категориях мы не обнаружили ожидаемой обратной зависимости – успешность формирования категорий была одинаковой при любой форме обратной связи, $F<1$.

Почему в статистически-неплотной категории не было обнаружено зависимости от вербальной и невербальной формы обратной связи? Мы предположили, что используемые нами знаки даже в случае невербальной формы (разный цвет обозначения) испытуемые могли спонтанно вербализировать, произносить про

себя «красный» и «зеленый». Об этом свидетельствовали самоотчеты испытуемых. Для контроля этой внутренней вербализации мы провели дополнительную экспериментальную серию, используя для формирования статистически-неплотной категории знаки, имеющие один цвет и разную форму, не напоминающую никакой объект. Иными словами, эти знаки было трудно спонтанно назвать каким-нибудь именем. Дополнительно после формирования категории мы просили испытуемого ответить, давал ли он какие-нибудь названия этим знакам, и оценить по десяти-балльной шкале, насколько часто он это делал.

Оказалось, что в этом случае испытуемые были значительно менее успешны, чем при использовании знаков из предыдущей серии, $F=3.93$, $p<0.05$, $\eta_p^2=0.17$. Кроме того, дополнительная оценка показала, что действительно мало испытуемых использовали спонтанную вербализацию и она не была связана с успешностью формирования категорий.

Наше исследование показало, что для категорий разного типа существует разная зависимость от различных свойств знака: успешность формирования статистически-плотных категорий выше при усилении перцептивных свойств знака, а статистически-неплотных – при усилении вербальных.

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ФРОНТАЛЬНАЯ АСИММЕТРИЯ ЭЭГ КАК УПРАВЛЯЮЩИЙ СИГНАЛ В НЕЙРОКОМПЬЮТЕРНЫХ СИСТЕМАХ КОРРЕКЦИИ ЭМОЦИОНАЛЬНЫХ СОСТОЯНИЙ

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1. Введение. Фоновая фронтальная асимметрия ЭЭГ (ФФА) может служить маркером риска различных эмоциональных расстройств, таких, как депрессия, тревожность и др. (см. обзор Coan and Allen, 2004). Исследователи

обнаружили связь между относительно меньшей во фронтальных областях слева активацией (левосторонняя гипофронтальность) и состояниями эпизодической и сезонной депрессии. Даже у младенцев подмечено, например, что при изоляции от матери плачут больше те из них, у которых наблюдается левосторонняя гипофронтальность (Davidson, et al 1989). Как правило, индекс ФФА рассчитывают путем вычитания

логарифмированной мощности альфа-активности ЭЭГ слева из аналогичного показателя справа в гомологичных фронтальных отведениях (F3, F4): ФФА индекс = $\ln(R) - \ln(L)$. Согласно этой формуле, снижение индекса ФФА свидетельствует о нарастании левосторонней лобной гипофронтальности (Sutton et al., 1997).

2. Постановка проблемы и парадигма исследования. Обычно показатели билатеральной асимметрии ЭЭГ рассматриваются как оценки соответствующих стационарных отношений между полушариями, что, однако, не соответствует реальной динамике межкорковых отношений. Ранее нами и другими исследователями было уже показано, что ЭЭГ является крайне нестационарным процессом (см. обзоры А. Каплан 1998, А. Kaplan, 2005a), поэтому трудно было ожидать, что индекс ФФА будет оставаться стационарным даже в течение десятков секунд. Можно полагать, что наблюдаемая в усредненных показателях левосторонняя гипофронтальность на самом деле есть совокупность эпизодов лево/правосторонней асимметрии с преобладанием последних по комбинации их интенсивности и продолжительности. В этой связи возникает идея биотехнической коррекции левосторонней гипофронтальности путем оперативного детектирования ее эпизодов по уменьшению индекса ФФА ниже порога и автоматического включения кратковременной аверзивной фотостимуляции, десинхронизирующей ЭЭГ с обеих сторон, что могло привести к повышению индекса ФФА в связи с непропорционально большим уменьшением альфа-активности слева. Целью настоящего исследования было проверить гипотезу о том, что, избегая аверзивную фотостимуляцию, мозг человека может «приспособиться» удерживать билатеральную асимметрию ЭЭГ по индексу ФФА выше порога левосторонней гипофронтальности. Варианты неосознаваемой коррекции ЭЭГ в пользу выбранного критерия биотехнической детекции событий в ЭЭГ были нами показаны ранее на примере управляемой от ЭЭГ палитры RGB-монитора (А. Kaplan et al. 2005b).

3. Результаты исследования. В исследовании на 9 здоровых испытуемых обоего пола было показано, что у 5 из них суммарная продолжительность эпизодов левосторонней гипофронтальности (ФФА < 0.1) длительностью не менее 4 с при закрытых глазах составляла в повторных 3-х минутных записях в среднем 17%, а у остальных – 48%. Включение испытуемых последней группы в контур нейрокомпьютерной коррекции ФФА привело в 10 последовательных сессиях к постепенному росту индекса ФФА до

значений 0.3–0.4, что в 2.5–3 раза выше, чем в фоновой ЭЭГ у этих испытуемых без ФФА-зависимой фотостимуляции. Одновременно с этим с 48% до 10–15% уменьшилось суммарное время эпизодов левосторонней гипофронтальности. В то же время у испытуемых группы с небольшой представленностью эпизодов левосторонней гипофронтальности (17%) после включения нейрокомпьютерной коррекции существенных изменений в ЭЭГ не происходило.

4. Заключение. Полученные данные свидетельствуют о том, что, во-первых, билатеральная асимметрия ЭЭГ, по крайней мере, во фронтальных отведениях является весьма динамичным феноменом и можно говорить лишь о пропорции суммарной продолжительности кратковременных эпизодов асимметрии обоих знаков, например, гипер- и гипо-фронтальности слева в течение периода наблюдения. Во-вторых, индивидуальные особенности временной структуры ФФА могут в большей или меньшей степени корректироваться путем включения аверзивной фотостимуляции, связанной с эпизодами левосторонней гипофронтальности, в зависимости от исходных значений суммарной продолжительности этих эпизодов: чем они больше, тем сильнее сказывается коррекция. Наконец, в третьих, корректирующий эффект привязанной к эпизодам левосторонней гипофронтальности фотостимуляции постепенно развивается во времени в течение многих сессий тестирования, что свидетельствует о перестройке механизмов мозга в направлении снижения пропорции эпизодов левосторонней гипофронтальности. Задачей на будущее остается проверить, как могут быть практически использованы возможности нейрокомпьютерной коррекции ФФА в сторону увеличения фронтальной активации слева в курировании расстройств эмоциональной сферы у человека.

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КОНЦЕПТУАЛЬНО-СМЫСЛОВАЯ МОДЕЛЬ ОБРАЗОВАНИЯ ЛЕКСИЧЕСКОЙ ПОЛИСЕМИИ

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1. Введение. Описываемая модель базируется на двух фундаментальных результатах: когнитивном — понятие базового концепта (Э. Рош, Дж. Лакофф и др.), и языковом — дихотомия «основное VS производное значение» слова (А.С. Шишков, В.В. Виноградов, Р. Якобсон и др.). Согласно В.В. Виноградову, знаменательные слова (предметные существительные и глаголы действия) имеют одно основное и несколько производных (от основного) значений. Основное значение отражает понимание «кусочка действительности», а производное значение — это расширенное основное значение, «обросшее ... смысловыми оттенками».

Например, слово *обезьяна* имеет основное значение — «Животное определенного вида и поведения» и производные значения: (а) «Очень некрасивый человек», ср.: *Ее муж настоящая обезьяна!*, (б) «Бестактный, «дикий» человек», ср.: — *Ах ты, обезьяна! Ты у кого спросил-то?* (в) «Мех нутрии, выделанный под обезьяний» и др.

Развивая указанные результаты, мы строим порождающую модель лексической полисемии. Отметим ее главные черты (см. также Кошелев 2011).

2. Базовый концепт мы определяем как **обобщенный (концептуальный) объект** (далее просто ОБЪЕКТ) — сложную когнитивную единицу, представляющую собой совокупность **Формы, Действия и Интенции**:

(1) Концепт = концептуальный ОБЪЕКТ = тройка (Форма, Действия, Интенции).

Здесь Форма — это структура элементарных пространственных объемов, составляющих типичный объект, Интенции — суть содержательные характеристики Формы (для живого существа — это желания, цели, намерения, потребности, для предмета — его функции), а Действия — это типичные физические действия Формы, посредством которых реализуются ее Интенции (цели или функции).

ОБЪЕКТ (1) задает свою **категорию** конкретных объектов, схожих с ним по всем трем характеристикам. В итоге получаем пару: концептуальный ОБЪЕКТ (1) + задаваемая им Категория. Эта пара формируется в **процессе когнитивного развития** ребенка независимо от

усваиваемого им родного языка и хранится в его долговременной памяти.

3. Основное значение слова и есть эта пара, точнее, ее главный компонент — ОБЪЕКТ (1). Ребенку для усвоения слов родного языка нужно лишь приписать таким своим парам правильные имена. Таким образом, **слово в основном значении** имеет вид:

(2) Имя — ОБЪЕКТ (Основное значение) — Категория (Референты),

(2а) *Обезьяна* — объект ОБЕЗЬЯНА — Категория (Референты) «Обезьяны».

Подчеркнем: Основное значение слова понимается всеми носителями языка одинаково, независимо от их знания конкретной референтной ситуации. Поэтому, к примеру, фраза *Это — обезьяна* в основном (концептуальном) значении будет понятна любому носителю языка, независимо от того, видит он называемую обезьяну или нет.

4. Производное значение слова имеет принципиально иную природу. Оно **всегда** указывает на объект **другой** (не своей) категории. Более того, разные объекты-референты могут относиться к различным категориям. Например, фраза *Смотри, какая обезьяна* в одном из своих производных значений может указывать на некрасивого мужчину, а в другом — на обезьяний (или похожий на обезьяний) мех. Как мы видим, ее референты (человек и мех) — не обезьяны, а члены других категорий.

Естественно возникает вопрос: как слушающий понимает слово в производном значении и идентифицирует его референт? Наш ответ таков: он может сделать это только при условии, что он или видит референтную ситуацию, или хорошо ее знает. В этом случае, опираясь на основное значение (ОБЪЕКТ), он **«вычисляет»** референт слова в производном значении, а именно: ищет в референтной ситуации объект **другой** категории, который находится в **отношении сходства** с ОБЪЕКТОМ, т.е. сходен с ним **по какому-то отдельному свойству**. Так, будучи свидетелем референтной ситуации фразы *Смотри, какая обезьяна*, мы без труда вычисляем ее референт. Скажем, находясь на пляже, мы легко обнаружим, что это аномально волосатый или некрасивый человек; наблюдая за юношей, ловко взбирающимся по веткам на вершину дерева, мы сразу поймем, что речь идет именно о нем. Наконец, находясь в магазине меховых изделий, мы легко соотнесем эту фразу с обезьяньим мехом. Подчеркнем:

во всех случаях фраза указывает **на такое свойство объекта-референта**, которое **сходно с типичным свойством обезьяны**: или на некрасивость / волосатость человека, или на мех обезьяны (о двух других отношениях — метонимическом и синекдохическом см. в статье (Кошелев 2011)). Условимся далее **производное значение** называть **смыслом**.

Итак, в отличие от основных, **производные значения** (смыслы) слов **не хранятся в памяти носителя языка**, а стало быть, **не входят в лексикон языка**. Они всякий раз **порождаются** говорящим для описания конкретного объекта-референта, и **реконструируются** слушающим, воспринявшим его фразу и описываемую ею референтную ситуацию. Конечно, часто встречающиеся смыслы оседают в памяти человека. Их, естественно, следует включать в толковый словарь языка.

5. Порождение смыслов. Из сказанного следует, что для порождения и понимания смысла (производного значения) слова носитель языка должен знать **все типичные свойства** своих концептуальных ОБЪЕКТОВ, в частности, концепта ОБЕЗЬЯНА. Тогда, видя объект, допустим, человека, свойство которого он хотел бы назвать, говорящий отыскивает в своей памяти концепт со схожим типичным свойством (концепт ОБЕЗЬЯНА с типичными свойствами: «похожа на некрасивого / волосатого / неуправляемого / кривляющегося / очень ловкого / живущего на деревьях ... человека») и указывает на нужное свойство, называя человека обезьяной: *Смотри, какая обезьяна*.

Естественно спросить, в каком виде хранятся в памяти человека типичные свойства концепта? Ясно, что не отдельным списком. В новой

референтной ситуации может актуализироваться новое типичное свойство, не встречавшееся ранее. Так, фраза *Петя — маленькая обезьянка* в зависимости от ситуации может обозначать, что Петя 1) кривляется и гримасничает, 2) ловко лазает по деревьям, 3) очень суетливый и непослушный и т.д. Дочь Пиаже Жаклин в возрасте 2 года 3 месяца подняла расческу над головой и сказала: *Это зонтик*. Если бы расческа лежала на столе, то фраза была бы некорректной, но, поднятая над головой, она этим действием становится похожа на использование зонтика (типичное действие концепта ЗОНТИК из его компонента Действия) и потому фраза Жаклин совершенно корректна.

Но откуда носитель языка берет эти свойства? Наш ответ таков: он извлекает их непосредственно из концептуального ОБЪЕКТА. Ведь это обобщенный объект, т.е. обобщенное представление произвольного референта (члена категории). Поэтому **любое** его свойство является типичным. Отсюда — неисчерпаемость списка этих свойств. Главное: человек должен уметь находить в своей памяти поименованный концепт с подходящим свойством.

Подчеркнем: все смыслы слова порождаются «веером» — непосредственно от концепта, а не один от другого, как в теории лексических сетей (Norvig and Lakoff 1987), подробнее об этом см. в статье А.Д. Кошелева (2011: 720—721).

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ЭМОЦИОНАЛЬНЫЙ ИНТЕЛЛЕКТ И ПРИНЯТИЕ РЕШЕНИЙ

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Введение

Принятие решений (ПР), казалось бы, в разных ситуациях и на разных основаниях имеет общее свойство: оно предполагает реализацию субъектом интеллектуально-личностных усилий, посредством которых происходит снижение уровня неопределенности ситуации (ее разрешение, ее преобразование в соответствии со структурно более общими целями — от целей достижения прагматического

результата до целей личностного саморазвития) (Корнилова, 2003). Результирующее действие интеллектуальных и личностных усилий субъекта оформляется в процессы осознанного принятия им решения как произвольного выбора.

Из видов интеллекта, наиболее близко стоящих к системам регуляции решений, включающих ориентировку на роль и ценность другого человека, следует назвать эмоциональный интеллект — ЭИ (Корнилова и др., 2010). Нами была выдвинута гипотеза о том, что лица с более высокими уровнями развития ЭИ при принятии ими решений будут в большей степени, чем лица

№ задачи	Аналоги независимой переменной	Коэффициент детерминации	Коэффициент регрессии В	Уровень значимости р	Exp (В)
1	В1	0,356	0,483	0,042	1,621
2	М3	0,767	-2,083	0,125	0,125
	В1		1,112	0,096	3,041
3	ИТН	0,521	0,265	0,029	1,303
	М3		-0,931	0,077	0,394
4	Постконвенцион. уровень морали	0,367	0,523	0,077	1,687

Таблица 1. Результаты регрессионного анализа для вербальных задач

с низким ЭИ, использовать процессы контроля эмоций и переработки эмоциональной информации в разрешении ситуации неопределенности, включающей общение с другими (или учет их интересов). Неизвестно при этом, как регулятивная роль ЭИ может проявляться в профессиональной деятельности руководителей, строго нормируемой, если речь идет о военной службе.

Нашей исследовательской задачей было выделить эффекты влияний ЭИ, толерантности-интолерантности к неопределенности (ТН и ИТН) и уровней нравственного самосознания на выбор в вербальных задачах, где часть исходов отражала (а часть – нет) опору на использование ЭИ при достижении своих целей в ситуации предполагаемых взаимодействий с другими людьми.

Выделенный контекст рассмотрения ЭИ в системе предикторов выбора в вербальных задачах дает возможность оценивать различия в ситуационных условиях, провоцирующих использование ЭИ.

Процедура и методики исследования

Испытуемые. В исследовании приняли участие 49 человек – военные руководители (возраст $M = 31,97$; $SD = 4,02$).

Материал вербальных задач. В четырех задачах моделировались проблемные житейские ситуации выбора, в каждой выход мог быть выбран из альтернатив с применением – неприменением ЭИ. В задачах 1–3 моделировалась ситуация общения, в задаче 4 речь шла о проблеме эмоциональной саморегуляции без включения в ситуацию общения с другими людьми. Зависимая переменная включала перевод предпочтений альтернатив в дихотомическую шкалу (есть или нет при ПР ориентировки на эмоции).

Применялись психодиагностические методики:

1. Опросник эмоционального интеллекта Д. Люсина (Люсин, 2006). Предназначен для измерения ЭИ. В структуре ЭИ выделяется межличностный ЭИ (МЭИ) – понимание эмоций других людей и управление ими – и внутриличностный ЭИ (ВЭИ) – понимание собственных

эмоций и управление ими. Опросник ЭИИ даёт баллы по трём субшкалам, измеряющим различные аспекты МЭИ, и по трём субшкалам, измеряющим различные аспекты ВЭИ.

2. Новый опросник толерантности к неопределенности (НТН) (Корнилова и др., 2010). Три шкалы позволяют оценить: ТН – как генерализованное свойство, отражающее готовность к решениям, действиям и общению при неполноте ориентиров и неясности, а также к принятию новизны и неопределенности; ИТН – как стремление к ясности, следованию правилам и нормам; МИТН – межличностная интолерантность к неопределенности – стремление к ясности и контролю в межличностных отношениях.

3. Опросник «Справедливость – забота» (Молчанов, 2005). Предназначен для измерения уровня развития моральных суждений в соответствии с двумя основными периодизациями развития морального сознания: периодизации Л. Колберга и модели К. Гиллиган – Н. Айзенберг.

Результаты обработки данных с указанием переменных, выступивших значимыми предикторами выборов в каждой из 4-х задач, представлены в табл. 1.

Задача 1. Предиктором предпочтения опоры при ПР на ЭИ выступило увеличение показателя способности к осознанию своих эмоций: их распознавание и идентификация, понимание причин их возникновения (шкала В1); в этой ситуации В1 способствовало ПР, включающего в разрешение ситуации ориентировку на эмоции близкого друга.

Задача 2. Увеличение показателя способности к осознанию своих эмоций, способности к вербальному описанию (также шкала В1) способствовало ПР как включающему ориентировку на собственные эмоции в ситуации контактирования с неприятным человеком; при этом в той же ситуации препятствующим фактором выступило увеличение показателя контроля чужих эмоций, способности вызывать у других людей желательные эмоции, снижать интенсивность нежелательных (шкала М3).

Задача 3. Увеличение показателя интолерантности к неопределенности (отражающего стремление к ясности, следованию правилам и нормам) способствовало ПР на основе учета эмоций другого человека в ситуации взаимодействия с конфликтным начальником; при этом в той же ситуации препятствовало принятию такого решения увеличение показателя управления чужими эмоциями, способности вызывать у других людей желательные эмоции, снижать интенсивность нежелательных (шкала МЗ).

Задача 4. В этой ситуации, не включавшей общение, лицами с более высоким уровнем индивидуальной морали (шкала постконвенциональной стадии, отражающая ориентированность на социальные контракты, учет прав личности, универсальные этические принципы) в ситуации, связанной с проблемой саморегуляции, не предполагающей общения, чаще предпочитались выборы в пользу использования ЭИ.

Таким образом, в ситуациях ПР, включающих общение, показатели внутриличностного ЭИ (шкала В1) и межличностного ЭИ (шкала МЗ) выступают предиктором предпочтения разрешения ситуации с использованием ЭИ.

Выводы

1. Показано, что ЭИ может выступать значимым предиктором ПР.

2. Установлено влияние фактора задач (ситуации, предполагающие общение или нет) на использование ЭИ при принятии решений.

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ОСОБЕННОСТИ МЕЖПОЛУШАРНЫХ СВЯЗЕЙ И БИОЭЛЕКТРИЧЕСКОЙ АКТИВНОСТИ МОЗГА ДОНОШЕННЫХ И НЕДОНОШЕННЫХ ДЕТЕЙ

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На ранних стадиях онтогенеза, в зависимости от того, на каком сроке внутриутробного развития плод подвергается влиянию неблагоприятных факторов, риск развития патологии мозга и ее характер различны. Перечень психоневрологических расстройств, обусловленных неблагоприятным пренатальным периодом и/или преждевременным рождением, чрезвычайно широк, начиная с минимальной мозговой дисфункции и заканчивая тяжелыми формами детского церебрального паралича и аутизма.

Современные методы лабораторных и клинических исследований изменили сложившиеся представления о закономерностях развития и трактографии ассоциативных связей мозга. В свете этого, задачи настоящей работы заключались в сравнительном анализе межполушарных связей мозга доношенных и недоношенных детей

первого месяца жизни по результатам магниторезонансной и диффузионно-тензорной томографии; ретроспективном анализе пространственных характеристик ЭЭГ детей первого месяца жизни, рожденных на разных сроках гестации, в зависимости от уровня их психомоторного развития, установленного в возрасте 1 года.

Механизмы интегративной деятельности головного мозга обеспечиваются трактами, связывающими различные области коры, мозолистое тело (МТ) объединяет ассоциативные внутриполушарные системы. Строгая топография каллозальных проекций, когда связи определенных корковых территорий строго приурочены к анатомическим частям комиссуры, позволяет по характеру гипоплазий МТ косвенно судить о состоянии ассоциативных связей мозга в целом. Исследуя взаимосвязь между развитием проводящих трактов и гетерохронной дифференцировкой неокортекса, мы предположили, что в зависимости от временного совпадения критического периода морфогенеза со сроком рождения патологический процесс затрагивает разные области коры. Ранее по критерию выделения субпластинки и особенностям развития клеток, иммунопозитивных к белку MAP2, мы установили, что первыми на путь дифференцировки

вступает кора теменно-височно-затылочной, нижней префронтальной, пред- и постцентральной областей полушарий (Краснощекова и др., 2010). Начинается этот процесс с 20-й недели гестации, то есть в период, на который приходится основное количество преждевременных рождений с вытекающими отсюда резкими изменениями условий развития и их крайне неблагоприятным влиянием на несформировавшиеся ассоциативные системы коры. В результате выдвинуто предположение о том, что с наибольшей вероятностью у недоношенных повреждаются перечисленные выше области коры, а также соответствующие ассоциативные тракты, в том числе каллозальные. Исходя из представлений о строгой топографии связей в составе мозолистого тела, нами был разработан объективный показатель «коэффициент мозолистого тела», или kMT, как соотношение размеров следующих частей комиссуры: колена и передней части ствола (связи префронтальной коры), перешейка (связи пред- и постцентральной коры), валика (связи теменно-височно-затылочной коры)

$$k\text{MT} = ((\text{MT2} + \text{MT3}) \times \text{MT6}) / \text{MT7},$$

где MT2 – площадь колена, MT3 – площадь передней части ствола, MT6 – площадь перешейка, MT7 – площадь валика. Эти части мозолистого тела предварительно выделяли на срединных сагиттальных томограммах, используя схему Вителсон.

В результате использования kMT при сравнительном анализе МР томограмм мозга, определены те его пороговые значения, по которым мозг недоношенных младенцев отличается от мозга детей группы контроля, даже в тех случаях, когда качественных отличий в организации проводящих трактов или серого вещества по стандартным критериям оценки выявить не удалось. Полученные результаты свидетельствуют о том, что наиболее выраженные отклонения у недоношенных младенцев имеются в системе комиссуральных связей коры префронтальной и теменно-височно-затылочной областей, а также, вероятно, в системе фронто-темпоральных. При исследовании мозга детей методом диффузионно-тензорной томографии оценивался уровень фракционной анизотропии (FA) в пределах мозолистого тела. Выявлены пониженные значения FA у недоношенных, что указывает на слабо выраженный главный вектор диффузии и является признаком нарушения системы каллозальных трактов – меньшем количестве аксонов, их более слабой миелинизации.

Доношенные и недоношенные новорожденные различаются по показателям пространственной синхронизации ЭЭГ, как при благополучном,

так и при нарушенном психо-моторном развитии. Ретроспективный анализ пространственно-временных характеристик ЭЭГ в группах доношенных и недоношенных новорожденных проводили с учетом их неврологического статуса, который определяли в возрасте 1 год на основании углубленного неврологического обследования и оценки психомоторного развития (ПМР), по методике Журбы-Тимониной. В результате детей раннего грудного возраста условно разделили на группы: 1. доношенные новорожденные с благополучным ПМР (19 детей, средний гестационный возраст 39.71 ± 1.32 недель); 2. доношенные новорожденные с легкими нарушениями ПМР (11 детей, гестационный возраст 39.00 ± 1.92 недель); 3. недоношенные новорожденные с благополучным ПМР (15 детей, гестационный возраст 34.64 ± 1.03); 4. недоношенные новорожденные с легкими нарушениями ПМР (9 детей, гестационный возраст 33.86 ± 1.67); 5. недоношенные новорожденные с выраженными нарушениями ПМР (15 детей, гестационный возраст 33.00 ± 1.41). У всех детей ЭЭГ регистрировали в возрасте 10–40 дней после рождения в 10 монополярных отведениях (передних фронтальных – Fp1, Fp2, нижних задних фронтальных – F7, F8, центральных – C3, C4, задневисочных – T5, T6, и затылочных – O1, O2, размещенных на голове симметрично над левым и правым полушариями мозга). Для оценки особенностей пространственно-временной организации ЭЭГ использовали корреляционный и когерентный анализ. В результате попарного сравнения результатов анализа ЭЭГ детей перечисленных групп обнаружили, что у недоношенных младенцев, вне зависимости от уровня ПМР, определяемого в возрасте 1 год, уже в период новорожденности наблюдаются более низкие уровни пространственной синхронизации ЭЭГ, свидетельствующие о задержке процессов межцентральной интеграции и возможных нарушениях в системе внутри- и межполушарных связей.

Таким образом, результаты проведенного комплексного исследования подтверждают выдвинутое предположение о том, что преждевременное рождение нарушает процесс развития неокортекса, особенно той его составляющей, которая обеспечивает формирование ассоциативных систем коры полушарий мозга.

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ПРОСТРАНСТВЕННЫЙ ДЕЙКСИС В РЕЧИ ДЕТЕЙ: ЛОКАТИВНЫЕ МЕСТОИМЕННЫЕ НАРЕЧИЯ И СОЧЕТАНИЯ МЕСТОИМЕНИЙ С ПРЕДЛОГАМИ

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О когнитивном освоении пространственных категорий свидетельствует появление в лексиконе ребенка арсенала средств, выражающих пространственный дейксис. Если ребенок употребляет слова с дейктическим значением, можно констатировать, что у него сформировано некоторое представление о «Я» как о дейктическом центре, он ориентируется на определенную систему отсчета и в соответствии с ней обозначает различные элементы действительности, а также он способен осознавать пространственную оппозицию «близость/дальность» (см. Еливанова 2006).

Из всех пространственно-дейктических средств русского языка ребенку до четырех лет доступны указательные жесты, указательные частицы (*вот*), локативные местоименные наречия (*здесь, там*) и местоимения с предлогами (*в нем, в этом*).

На ранних этапах развития речи только локативные наречия берут на себя пространственные функции. Они появляются позже указательных жестов и указательных частиц, однако первыми начинают обозначать именно положение предмета и расстояние до него. В нашем материале первые локативные наречия зафиксированы в возрасте 1;3 (здесь и далее возраст приводится в формате «год; месяц»), в то время как первые локативные предложные сочетания с *он* отмечены в 2;6, с *этом* – в 2;4, то есть примерно через год. Время появления коррелирует с частотностью употребления: из трех основных локативных средств местоименные наречия используются детьми в 88% случаев, тогда как местоимениям *он* и *этом* с предлогами отводится по 6%. Таким образом, следует отдельно рассматривать два следующих противопоставления: с одной стороны, местоименные наречия и предложные сочетания, с другой – местоимения *он* и *этом*.

Известно, что во многих контекстах личное местоимение третьего лица *он* ведет себя подобно указательному (Грамматика 1970 даже предлагает рассматривать его не среди личных, а среди указательных). Тем не менее, в речи ребенка местоимение *он* четко отделяется от указательных. Это справедливо как для беспредложных, так и для предложных употреблений.

Ребенок соотносит каждое местоимение со своей функцией. В речи взрослых для *он* характерна в основном анафорическая функция, для *этом* одинаково возможны как анафорическая, так и указательная. Ребенок осваивает функциональную разницу между *он* и *этом* в три этапа. На первом (примерно до 2;3–2;6 лет) основной функцией для всех местоимений является указательная, но анафорическая выступает как дополнительная для *он*. Главенство указательной функции на ранних этапах развития речи можно объяснить коммуникативными потребностями ребенка: не успевая извлечь из ментального лексикона полнозначное слово, он обозначает предмет первым всплывшим в памяти местоимением. На втором этапе *он* воспринимается ребенком как универсальное анафорическое местоимение, *этом* – как универсальное указательное. Функции становятся распределены по местоимениям, конкуренции местоимений в одинаковых контекстах не происходит. На третьем этапе *этом* начинает употребляться и в анафорической функции.

Локативные наречия проходят такой же путь функционального развития: изначально единственной возможной для них функцией является указательная, затем, около 2;5 лет, к ней добавляется анафорическая. С этого времени число наречий в анафорической функции превышает число анафорических контекстов с другими указательными единицами, то есть дети активно используют анафору именно с локативными словами. Если с именными antecedентами ребенок предпочитает использовать *он*, а к анафоре к ситуации (см. Падучева 1985:165) он практически не прибегает (что также вызывает редкость *этом* в анафорической функции), то для antecedентов с локативным значением он использует локативные наречия. Разделение местоимений по функциям, таким образом, выглядит так: *он* – анафорическое, указательные местоимения и локативные наречия – указательные, однако уже с 2;5 локативные наречия также начинают приобретать анафорические свойства. К 3 годам ребенок прибавляет к анафорическим словам и указательные местоимения. Развитие анафорической функции связано с развитием нарративного дейксиса и текста как такового, а также со способностью вести отсчет не только от дейктического центра («я–здесь–сейчас») и с появлением перемещенной точки отсчета. Тем

не менее даже при регулярном использовании анафорической функции ребенок отдает предпочтение указательной для локативных наречий и *этот*.

Заметив, что некоторые слова могут равноценно употребляться и в указательной, и в анафорической функции, ребенок распространяет эти свойства на указательные местоимения. Здесь локативные наречия действуют как «авангард» указательных слов. Они опережают другие указательные слова и «прокладывают им дорогу» в языковую систему. Этому существует несколько свидетельств. Во-первых, локативные наречия первыми из всех указательных слов появляются в речи ребенка. Во-вторых, они первыми начинают употребляться в поддерживающих/уточняющих конструкциях («в лесу, там живут волки»/ «там, в лесу живут волки»), а также чаще других употребляются в этой функции. В-третьих, они чаще других употребляются и в анафорической функции. Локативные наречия неизменяемы и просты для запоминания и произношения. На них ребенок пробует новые возможности и функции, которые затем переносит на собственно указательные местоимения, и они позволяют ребенку быстрее осваивать систему указательных местоимений. Этим в том числе объясняется их популярность у детей.

Таким образом, ребенок сталкивается с противоречием: с одной стороны, в большом количестве случаев, согласно статистике, он не может выразить пространственные отношения сочетаниями с предлогом и останавливается на локативных наречиях. С другой стороны, он не может использовать анафору с локативными наречиями и должен обратиться к местоимению *он* с предлогом. В результате анафорические конструкции, выражающие пространственные отношения, крайне редки. Ребенок предпочитает использовать в таких ситуациях полноточные существительные с предлогом. Локативные употребления существительных, по свидетельству Н. В. Ионовой (2007), достаточно частотны в речи детей. Анафорические цепочки с пространственным значением ребенок учится строить в возрасте 4–5 лет.

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ГЕНДЕРНЫЕ ОСОБЕННОСТИ ФОРМИРОВАНИЯ НАВЫКОВ ПИСЬМА И ЧТЕНИЯ У ДЕТЕЙ 9–10 ЛЕТ

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Исследования, посвященные влиянию пола на школьную успеваемость, достаточно многочисленны как у нас в стране, так и за рубежом. Однако в научных исследованиях и у практиков нет единой концепции возникновения и развития трудностей обучения письму и чтению у мальчиков и девочек [Булохов В. Я., 1999, Корнев А. Н., 2005, Kleinfeld D. 2005]. В рейтинге PISA 2009 по всем странам девочки читают лучше мальчиков. Среди плохо читающих детей мальчиков значительно больше, чем девочек. Соответственно среди читающих отлично доля девочек выше, чем мальчиков.

В настоящее время существует много теорий о том, почему мальчики отстают от девочек в чтении. По мнению Kleinfeld D., у девочек наблюдается лучшая сформированность речевых

навыков, тогда как у мальчиков лучше развиты пространственные представления. Мальчикам необходим другой подход в обучении – больше двигательной активности, меньше времени сидения за столом, а также они нуждаются в более разнообразных видах чтения. По мнению S. Camarata (2007), гендерные различия встречаются больше в письменной и устной речи (т. н. выразительной стороне речи), чем при чтении, прослушивании и зрительном восприятии текста (т. н. восприятии речи). А наибольшие половые различия встречаются в письменной речи и просмотре литературы. Несмотря на многочисленность и многообразие проведенных исследований, остается нерешенным вопрос о причинах и механизмах неодинаковой успешности освоения навыков письма и чтения мальчиками и девочками. Также мало работ, в которых изучались степень и особенности сформированности навыков письма и чтения у детей с учетом гендерной принадлежности. Учитывая

практическую значимость этой проблемы, в настоящей работе были поставлены следующие задачи:

- изучить успешность формирования навыков письма и чтения;
- изучить взаимосвязь между различными компонентами устной и письменной речи.

Для изучения степени и характера сформированности навыков письма и чтения использовалась «Методика определения уровня сформированности навыков письма и чтения в начальных классах» М. М. Безруких, О. Ю. Крещенко (2009). Статистическая обработка данных проведена по программе Statistika 6.5. Работа выполнялась на базах школ Москвы. В процессе тестирования были собраны данные 25 мальчиков и 26 девочек 9–10 лет, обучающихся в массовой школе. Все дети имеют ведущую правую руку.

Результаты исследования.

Анализ средних показателей выполнения заданий по письму у мальчиков и девочек позволил выявить следующие особенности. Ошибки звукобуквенного анализа и ошибки по акустико-артикуляторному сходству встречались у девочек в 2 раза меньше, чем у мальчиков (среднее кол-во ошибок мальчиков = 2,3, 2,4, среднее кол-во ошибок девочек = 1,0, 1,3, соответственно). Мальчики чаще девочек допускают ошибки по отграничению речевых единиц (среднее кол-во ошибок мальчиков = 3,4, среднее кол-во ошибок девочек = 2,8) и орфографические ошибки (среднее кол-во ошибок мальчиков = 4,3, среднее кол-во ошибок девочек = 3,6), что согласуется с данными других авторов [Булохов В.Я., 1999]. Почти в два раза чаще в работах мальчиков встречаются аграмматические ошибки (среднее кол-во ошибок мальчиков = 2,3, среднее кол-во ошибок девочек = 1,3), что отчасти обусловлено наличием грубых грамматических ошибок и в устной речи мальчиков [Горошко Е.И., 1996]. Ошибки конфигурации букв, в среднем, встречаются в работах мальчиков и девочек практически одинаковое количество раз (среднее кол-во ошибок мальчиков = 3,0, среднее кол-во ошибок девочек = 2,4). Ошибки обозначения мягкости согласных и персеверации встречаются в работах мальчиков и девочек одинаково редко (в среднем по одной ошибке в работе). Общее количество ошибок в письменных работах мальчиков гораздо больше, чем в письменных работах девочек (среднее кол-во ошибок мальчиков = 11,6, среднее кол-во ошибок девочек = 7,1). Таким образом, к моменту окончания начальной школы грамотное оформление письменной речи у мальчиков сформировано хуже, чем у девочек.

Формирование почерка у мальчиков идет также с большими трудностями, чем у девочек. Средний балл мальчиков 8,4, что свидетельствует о нарушениях формирования этого навыка, тогда как у девочек почерк формируется почти без проблем, со средним баллом 6,2. Лучшее формирование почерка у девочек отмечено во многих работах. [Садовникова И.Н., 1995, Корнев А.Н., 2005]. Объясняется это хорошим развитием мелкой моторики рук у девочек.

Как показало наше исследование, сформированность навыка письма у мальчиков во многом определяется степенью развития зрительно-моторного компонента, что подтверждается выраженной корреляционной взаимосвязью ($r=0,71$, $p<0,05$). Кроме того, обращает на себя внимание выраженная взаимосвязь между знанием и умениями грамматически правильного оформления речи и умениями вычленивать и правильно оформить на письме речевые единицы ($r=0,93$, $p<0,05$). У девочек подобных корреляций не выявлено.

Навык чтения сформирован у детей 9–10 лет следующим образом: в предложенных заданиях по прочтению отдельных букв, слогов, слов, а также текста мальчики допустили меньше технических ошибок, чем девочки. Однако при чтении текста отмечено: мальчики хуже, чем девочки, отвечали на вопросы по содержанию, т.е. они не поняли текст в полном объеме. Полученные данные подтверждают мнение S. Samarata (2007) о том, что методика преподавания чтения для мальчиков не совсем адекватна, т.к. не мотивирует процесс чтения. Уроки чтения в том виде, в котором они предлагаются в процессе школьного обучения, мальчикам не интересны, и возникшие трудности впоследствии могут усиливаться. Проведенные исследования выявили неодинаковый характер формирования навыков письма и чтения у мальчиков и девочек. Комплексное сопоставление взаимосвязей сформированности навыков письма и чтения у детей 9–10 лет показало, что к моменту окончания начальной школы их количество и теснота более выражена у девочек, чем у мальчиков, что может объяснять лучшую успеваемость девочек по сравнению с мальчиками.

Таким образом, проведенное исследование показало: практически все компоненты навыка письма у мальчиков формируются с большими трудностями, чем у девочек. В то же время мальчики лучше девочек справляются с прочтением изолированных речевых единиц. При этом чтение и понимание смыслового содержания текста мальчикам дается труднее, чем девочкам. Полученные данные подтверждают

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ЯЗЫК ОПИСАНИЯ ПСИХИКИ. МЕЖДУ ФИЛОСОФИЕЙ И ПСИХОЛОГИЕЙ

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В недавно переведенной на русский язык книге М. Томаселло (2011) суммируются результаты многочисленных исследований, предметом которых была коммуникация у человеческих младенцев, у детенышей, а также и у взрослых человекообразных обезьян. В описаниях экспериментов и наблюдений, в которых интерпретируется поведение детей, часто обращает на себя внимание одна проблема – на каком языке возможно такое описание поведения младенца. Когда годовалый младенец использует указательный жест, чтобы информировать мать, что вещь, которую она ищет, находится в ведерке с фруктами (Томаселло, 2011: 109, 116), слово «информировать» не кажется здесь неуместным. Однако слова «к девяти месяцам младенцы понимают, что у других есть цели» (там же, 127) кажутся несколько более проблематичными, поскольку слово «понимает» явно относится к внутреннему миру младенца, для суждений о котором у нас нет надежных средств. Еще более проблематичной оказывается ситуация, когда трехмесячные младенцы прослеживают взгляд матери, и далее, когда в известных экспериментах Э. Мелтзоффа новорожденные младенцы демонстрируют подражание мимике взрослого. Е.И. Сергиенко (2006: 14) резюмирует: младенец не сенсомоторный индивид, но репрезентативный. Мне не кажется, что вопросы о том, кто является субъектом врожденных реакций типа подражания мимике и что означает по отношению к младенцу слова «иметь репрезентацию», имеют простое решение. Могут ли эмпирические исследования вообще дать нам право на подобные утверждения?

В конце прошлого века философы, примыкающие к аналитическому направлению, вели дискуссию о месте, которое можно предоставить в

научной психологии обыденным понятиям типа «желания» и «веры». Этих философов не интересовали эмпирические исследования, речь шла о принципиальном решении. В результате были сформулированы несколько подходов: репрезентационизм (Fodor, 1987), в котором «репрезентация» означала представление модели внешнего мира в некотором компьютеро-подобном символическом виде; элиминативизм (Ramsey, Stich, Garon, 1990), который, опираясь на коннекционистское представление о психике, отвергал полностью возможность включения подобных понятий в научную психологию; различные вариации так называемой «теории теории», например, (P.M. Churchland, 1989); «симуляция без интроспекции» (Gordon, 1995) и ряд других. Дискуссия не привела участников к согласному мнению. Скорее, она продемонстрировала нечто похожее на отношения противопоставленных тезисов в кантовских антиномиях, когда разум ставит перед рассудком задачи, выходящие за рамки опыта. Я полагаю, что к таким же результатам привела бы дискуссия о наличии репрезентаций у младенца, да и вообще у человека.

Что может добавить к антиномиям эмпирическое исследование? Ничего, если не скорректировать язык описания феноменов. По сути, в психологических исследованиях, о которых речь шла выше, такой язык фактически вырабатывается. Это язык «осторожных» и условных проекций уточненного естественного языка описания психических состояний. Можно надеяться, что эти исследования и этот язык по сути расширят категориальный строй психологического знания (Кричевец, 2008) и придадут дополнительный импульс философским исследованиям проблемы Другого (Кричевец, 2010).

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«ЗАБЫВАНИЕ» КАК ПРИНЦИП ОБСУЖДЕНИЯ ПСИХОФИЗИОЛОГИЧЕСКОЙ ПРОБЛЕМЫ

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Проведенное нами нейропсихологическое исследование 280 больных с очаговыми поражениями мозга показало, что во всех случаях забывания предложенной больным информации просматриваются два механизма, описать которые можно следующим образом. Воспринятая информация как бы **«угасает»** в памяти, оставляя после себя лишь смутные, но достаточно обобщенные впечатления. В этом случае, пытаясь вспомнить необходимые сведения, больной не уверен в точности воспроизведения, при неудачном воспоминании у него возникает ощущение ошибки. Во втором случае образ информации **«трансформируется»** в памяти, но субъективно остается отчетливым и ярким. При этом даже значительные отличия воспоминаний от исходных данных не осознаются больным, ощущение ошибки отсутствует.

Первый тип забывания наблюдался при поражении левого полушария, второй – при поражении правого. Эти механизмы забывания проявлялись вне зависимости от поставленной задачи, условий запоминания, предъявляемого материала (несвязанные по смыслу слова, короткие рассказы, геометрические фигурки, сюжетные картинки, лица людей, события текущей жизни и т.д.). Например, при запоминании сюжетной картинки, в углу которой мальчик собирает грибы, примером угасания образа мог быть такой ответ больного: «Я не помню детали того, что здесь было нарисовано, но, по-моему, человек собирал грибы». Примером трансформации – **уверенное** описание многочисленных деталей (как правильных, так и ошибочных) и утверждение, что мальчик играет с собакой. При воспоминании событий повседневной жизни

выраженные нарушения памяти, протекающие по типу трансформаций, приводили к конфабляциям (О.А. Кроткова, 2008, 2010).

В норме забывание также связано с двумя описанными механизмами. Наличие «угасания» образов памяти подтверждается многочисленными экспериментальными исследованиями, начиная с работ Г. Эббингауза. Эти процессы хорошо осознаются, когда мы жалуемся на память и говорим, что не можем вспомнить то, что ранее было таким отчетливым и ясным. «Трансформация» наших воспоминаний в силу того, что эти процессы не осознаются, далеко не столь очевидна. Когда в специальных экспериментальных исследованиях испытуемым предъявляют доказательства ошибочности их воспоминаний, ошибка кажется невероятной: «Я помню ясно и отчетливо, но, как выясняется, совсем неправильно» (F. Bartlett, 1932; U. Neisser, 1992; В.В. Нуркова, 2010; К. Шабри, Д. Саймонс, 2011). Забывание – естественный процесс, в котором выделяются две стороны, два явления, сбалансированность которых у здоровых испытуемых обеспечивается нормальными межполушарными отношениями. Искажение этих же процессов, приобретение ими патологически выраженных, утрированных характеристик наблюдается при очаговых поражениях мозга.

Мы предполагаем, что «забывание» можно рассматривать, как базовый принцип переработки мозгом всей поступающей информации. В этом ракурсе психофизиологическая проблема приобретает определенную логическую завершенность. Приведем ряд пунктов (с учетом регламентированного объема тезисов), демонстрирующих нашу цепочку рассуждений.

1. К рождению ребенка его анализаторные системы сформированы. Младенец, появляясь на свет, испытывает ощущения. Внешняя энергия (световые лучи, звуковые волны, механические

воздействия) трансформируется в нейрофизиологический процесс.

2. Формирование нейрональных связей происходит в результате индивидуального опыта ребенка. Миллиарды нейронов контактируют друг с другом с помощью электрических и химических сигналов. Каждая поведенческая реакция – это сочетание огромного числа отдельных деполяризаций, имеющих определенную пространственную организацию и временную последовательность. Все впечатления новорожденного «забываются», но проходят при этом двойную обработку. Угасание, обтаивание, усреднение и обобщение информации при забывании, скорее всего, обеспечивается структурным, топографическим способом кодирования (исходное впечатление и воспоминание о нем будут различаться по нейрональному составу – «обтают» случайные, однократные, малозначимые элементы сети). Трансформация тех же впечатлений, напротив, скорее всего, связана с биохимическими процессами. Нейрогуморальная составляющая мозговой активности приведет к перестройкам, основанным не на частотности кодируемого события, а на связанных с ним субъективных ощущениях.

3. С каждым прожитым днем «забывается» все больше информации, постоянно самоорганизуются новые нейрональные системы. Нейропсихологические исследования описывают пространственное расположение функциональных систем мозга, участвующих в обеспечении психической деятельности. Эти топические характеристики являются оптимальными с точки зрения кратчайших расстояний между наиболее «тесно сотрудничающими зонами». Какой бы нейропсихологический симптом мы не рассматривали, его «топическая привязанность» никогда не будет неожиданной. Никакая зона мозга «не решает задачи», которые не были бы теснейшим образом связаны с задачами соседних областей. Нет четких границ, **нет дискретности**. Функции близлежащих областей мозга плавно «перетекают» в спектре решаемых ими задач, как цвета в радуге.

4. Все психические процессы имеют двустороннее представительство. В тех случаях, когда

нам кажется, что это не так, достаточно немного изменить термины, при помощи которых мы вычленим различные составляющие нашей психической жизни (память, внимание, восприятие, мышление), и не настаивать на неизбежности демаркационных линий между ними.

5. Двустороннее (в левом и правом полушариях) представительство **каждого** психического процесса можно условно описать в терминах «значения» и «личностного смысла». Относительная объективность «значения», которое привносит левое полушарие в протекающие процессы, основывается на зависимости процессов угасания образов памяти от частоты встречаемости сходных ситуаций. Процесс переработки информации является последовательным, определяется «удельный вес» каждого нового элемента в ряду других. «Смысл» – это то, что оценивается симультанно и однозначно, вне зависимости от составных элементов и их вероятностных характеристик. Переработка информации правым полушарием может быть описана, например, в терминах «это мне приятно» или «это мне неприятно». Обобщение личностного смысла происходит по принципу «на вкус и цвет товарищей нет». Это две взаимодополняющие грани, две стороны реализации **всех психических процессов**.

6. Содержание психической жизни определяется индивидуальным опытом, индивидуальными процессами «забывания» в жизни данного человека. Картирование мозга может показать, какой тип задач решает испытуемый в данный момент, но (даже если каким-то образом будет объективизирована работа каждого нейрона) никогда не определит, о чем конкретно он думает.

7. Вся воспринимаемая на протяжении жизни информация, все наши впечатления, мысли, переживания «забываются» и при этом как бы проходят двойную обработку. Выделяются их частотные, «значимые» характеристики и формируется субъективная «смысловая» составляющая. Последняя и создает иллюзию независимости нашей психической жизни от материального носителя.

ИССЛЕДОВАНИЕ УСПЕШНОСТИ РЕШЕНИЯ ДЕОНТОЛОГИЧЕСКОГО ВАРИАНТА (ОСНОВАННОГО НА ПРЕДПИСАТЕЛЬНЫХ ПРАВИЛАХ) ЗАДАЧИ ВЫБОРА УЭЙЗОНА

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Мышление взрослого образованного европейца отличается многообразием форм, однако исторически наиболее изученным типом мышления является логическое мышление. Вопрос о том, используют ли взрослые люди (не профессиональные логики) при построении умозаключений правила дедукции, соответствующие логическим правилам дедуктивного вывода, обсуждается довольно давно. В этом плане одним из наиболее показательных исследований является эксперимент П. Уэйзона (Wason, 1966, 1968). Испытуемым предъявлялись 4 карточки с изображенными на них следующими символами:

Е	К	4	7
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Далее испытуемым сообщалось, что каждая карточка на одной стороне имеет букву, а на другой – цифру. Задача состоит в том, чтобы оценить справедливость следующего правила, относящегося только к этим четырем карточкам: *Если на одной стороне карточки изображена гласная буква, то на другой ее стороне – четное число*. От испытуемого требуется перевернуть только те карточки, которые необходимо и достаточно перевернуть, чтобы оценить справедливость правила. Результаты показали, что подавляющее большинство испытуемых выбирали карточки Е и 4, что являлось логически неверным выбором. Правильный ответ – перевернуть карточки Е и 7, т.к. нечётное число на обороте карточки Е опровергло бы правило точно так же, как и гласная буква на обороте карточки 7. Согласная буква на обороте карточки 4 не опровергла бы правила, точно так же, как и чётная цифра на обороте карточки К, – следовательно, эти карточки не являются информативными для проверки данного правила. Таким образом, можно предположить, что для большинства испытуемых, во-первых, затруднительно определить ложность предпосылки (находить контрпримеры для опровержения) – об этом говорит устойчивое нежелание испытуемых выбирать карточку 7, а во-вторых, большинство испытуемых совершает другую логическую ошибку,

называемую *подтверждение следствия*, когда выбирает карточку 4.

В дальнейшем было сделано множество предположений, пытающихся объяснить данный феномен – почему же испытуемые систематически совершают логические ошибки? Одно из объяснений было предложено Ченгом и Холиуком (Cheng, Holyouk, 1985) – они предложили рассматривать условное утверждение «если-то» не только как логическую или вероятностную операцию, а как *разрешительную интерпретацию* (схема разрешения логической связки «если»). В эксперименте Гритгса и Кокса (Griggs & Cox, 1982) был получен следующий феномен: испытуемым предлагалась задача, структурно схожая с задачей выбора Уэйзона – от испытуемых требовалось проверить правило «Если человек пьёт пиво, то ему должно быть больше 19 лет», при этом им давалась инструкция представить, что они – офицеры полиции, в чью задачу входит следить за соблюдением правил употребления спиртных напитков. Карточки обозначали людей, сидящих в баре, – на одной стороне был напиток, который пьёт человек, на другой стороне – его возраст. Карточки были помечены следующим образом «пьёт пиво», «пьёт колу», «16 лет», «22 года». От испытуемых требовалось выбрать тех людей (перевернуть только те карточки) о которых требовалась дополнительная информация для определения того, нарушил человек закон или нет. В данном эксперименте 74% испытуемых выбрали логически верные карты – «пьёт пиво» и «16 лет», что соответствовало картам Е и 7 в задаче Уэйзона. Возможные объяснения данного феномена заключались в том, что испытуемым было знакомо правило (испытуемыми были студенты старших курсов университетов Флориды, где действовало это правило), – опыт, который испытуемый имеет о ситуации, позволяет вызывать в памяти возможность, когда предпосылка ложна, а следствие истинно (примеры: карточка «К» за которой цифра «4», карточка «22 года», за которой написано «пьёт колу») – все эти случаи не нарушают правило, совместимы с ним, и следовательно, не информативны для проверки.

Для проверки этого объяснения Ченг и Холиук (Cheng, Holyouk, 1985) провели следующий эксперимент – одной группе давалось для проверки бессмысленное правило «Если на одной стороне бланка написано въезд, то на

другой в списке болезней будет присутствовать холера». Другой же группе давалось разумное объяснение этого правила, связанное с идеей разрешения – чиновники по эмиграции могут разрешить человеку въезд в страну, только если у него есть прививка от холеры. Успешность группы, которая знала разумное объяснение правила, была намного выше, чем группы, которая знала только о бессмысленном правиле. Таким образом, неважно, имеет ли человек опыт столкновения с данным правилом, важно, чтобы к нему можно было применить идею разрешения.

В нашем исследовании мы пытаемся найти ответ на следующий вопрос – с чем связан феномен, возникший в задаче Григгса?

По нашему предположению, разрешительная интерпретация задачи связана с конструктом предписательности – правило социального контракта, сформулированное предписательно (т.е. четко указывающее, что и как делать можно, а что нельзя), побуждает испытуемых искать контр-примеры для правила и таким образом полноценно верифицировать (проверить) правило, а не просто подтверждать его.

В результате двух пилотажных серий (n=17 чел.) были получены следующие предварительные данные:

– феномен, зафиксированный в эксперименте Григгса, был получен – задача, требующая проверить поведение людей в баре, решалась в подавляющем большинстве испытуемых успешно. Кроме того, правила, похожие по смыслу и структуре на правило, использованное в эксперименте Григгса (правило, касающееся продажи алкоголя в магазине в ночное время, правило, разрешающее студентам курить в определенных местах и несколько других правил), проверялись испытуемыми также успешно (по сравнению с контрольным правилом из эксперимента Уэйзона)

– было выявлено влияние фактора формулировки правила – запрещающая формулировка правила оказалась более сложной для испытуемых (хуже проверялась), чем разрешающая формулировка этого же правила.

В основной экспериментальной серии мы планируем проверить наше предположение

о том, что за эффективностью разрешающей интерпретации условной связки «если» стоит некий универсальный *предписательный* конструкт, задающий верное направление проверки правила – в сторону его опровержения и поиска контр-примеров, а не в сторону подтверждения. Для проверки этого предположения были сформулированы следующие гипотезы:

1. Задачи, материалом которых являются предписательные правила, касающиеся условно-реальных объектов (ситуаций), будут решаться эффективнее, чем задачи, материалом которых будут правила, касающиеся условно-абстрактных объектов (ситуаций).

2. Условная формулировка правила (соответствующая условному утверждению «если антецедент, то консеквент») не влияет на успешность решения задачи, по сравнению с прямой формулировкой правила.

3. Задачи, материалом которых будут предписательные правила, касающиеся внешних либо внутренних референтных групп, к которым принадлежат испытуемые, не будут различаться по успешности решения.

Если в различных условиях успешность решения будет варьироваться, это будет значить, что наше предположение об универсальности предписательного конструкта ошибочно, и теоретическое объяснение феномена в задаче Григгса следует искать в особенностях репрезентации задачи испытуемыми.

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ОБЪЕКТИВАЦИЯ СИСТЕМНЫХ ПОКАЗАТЕЛЕЙ СОСТОЯНИЯ ОРГАНИЗМА: ОТ ФИЗИОЛОГИЧЕСКОГО ПРОЦЕССА К ПОСЛЕДОВАТЕЛЬНОСТИ СИМВОЛОВ

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Разработка методов объективации процессов адаптации человека к среде в рамках системного подхода (Крылов, Александров, 2008) требует разработки метода оценки качества взаимосвязи подсистем организма, что требует использования методов нелинейной динамики. Оценив выбранным методом здоровых и больных людей с определенным диагнозом (Гуров, 2010), оказывается далее возможным сделать вывод о том, какая динамика системных показателей соответствует здоровью.

Системные десинхронозы рассматриваются нами как рассогласование соотношения ритмов подсистем, например, кровообращения и дыхания (Загускин и др., 2011). Соответственно, системный десинхроноз оценивался нами по

отношению частоты пульса к частоте дыхания. Оказалось, что у пожилых практически здоровых людей по сравнению с молодыми практически здоровыми людьми дисперсия этого отношения больше и чаще выходит за нормальный диапазон от 3 до 5 (рис. 1).

Динамика функционирования подсистемы рассматривалась нами как чередование двух ее фаз и оценивалось количество событий в каждой фазе. Динамику сокращений сердца можно разбить на фазы повышения частоты сокращения, что соответствует преобладанию симпатического тонуса, и снижения частоты сокращения, что соответствует преобладанию парасимпатического тонуса, и в каждой фазе посчитать число ударов сердца (обычно от 1 до 4). Переход от одной фазы к другой можно закодировать символом в зависимости от того, сколько ударов было в предыдущей и последующей фазе (рис. 2, справа). В случае динамики сердечных сокращений оказывается достаточным 25 символов.

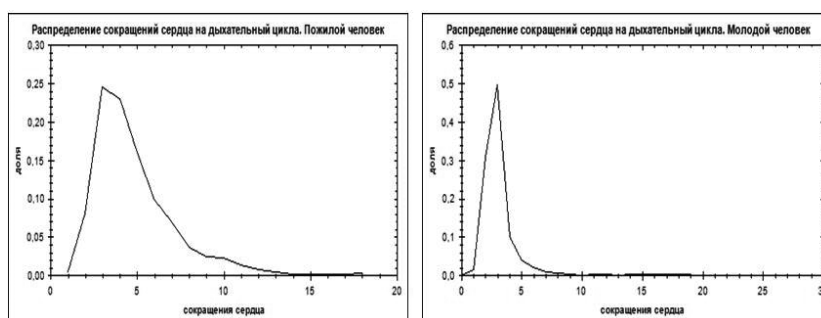
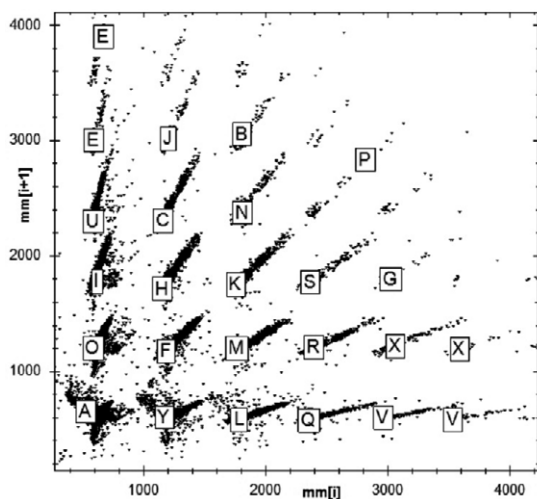


Рис. 1. Гистограммы отношения частоты пульса к частоте дыхания пожилого (слева) и молодого практически здоровых людей.



$b_{i+1} \backslash b_i$	1	2	3	4	>4
1	A	O	I	U	E
2	Y	F	H	C	J
3	L	M	K	N	B
4	Q	R	S	P	T
>4	V	X	G	Z	D

кодирование символами. Видно, какие символы встречаются чаще. Справа: таблица кодирования символами в зависимости от количества ударов сердца в текущей и последующей фазе. Например, символ «R» означает, что в текущей фазе было 4 удара, а в последующей – 2 удара.

Рис. 2. Слева: скаттерограмма длительностей фаз (в миллисекундах) превалирования симпатического или парасимпатического тонуса у одного испытуемого и ее кодирование символами. Видно, какие символы встречаются чаще. Справа: таблица кодирования символами в зависимости от количества ударов сердца в текущей и последующей фазе. Например, символ «R» означает, что в текущей фазе было 4 удара, а в последующей – 2 удара.

Тогда вся динамика функционирования подсистемы описывается словом, состоящим из этих символов.

Изучение особенностей такого языка функционирования подсистемы является самостоятельным методом и позволяет проводить диагностику. С помощью ряда показателей символической динамики (объемы словарей, условная энтропия и коэффициенты подобия) нами были выявлены характерные особенности различных состояний организма, таких как старение или патологии (Гуров, 2010). Оказалось, что для молодых здоровых испытуемых характерно большее разнообразие слов по сравнению с пожилыми здоровыми и с больными, причем основную роль в динамике функционирования подсистемы играют более короткие слова.

Такие методы оценки показателей динамики функционирования физиологической подсистемы и согласования функционирования подсистем применяются нами в психофизиологических экспериментах в качестве объективных показателей оценки когнитивной

и эмоциональной нагрузки. Для этого у испытуемого во время психологического тестирования одновременно регистрируются пульс и дыхание. Описанные показатели позволяют, в частности, объективно определять – какие задачи психологического теста вызвали наибольшее умственное напряжение или наибольшую эмоциональную реакцию.

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СЛЕПОТА ПО НЕВНИМАНИЮ: ИРРЕЛЕВАНТНАЯ РЕЛЕВАНТНОСТЬ

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Слепота по невниманию (здесь и далее СН) – неспособность наблюдателя воспринять ясно различимый объект (критический стимул), если его внимание занято иной задачей. В изначальной парадигме критический стимул является иррелевантным задачей зрительного слежения, но при этом пересекается по ряду признаков с целевыми объектами (Most et al, 2001, 2005; Bressan, Pizzighello, 2008). То есть существует потенциальная возможность включения его в класс целевых. В исследованиях СН показано, что более широкая категория, задаваемая семантически, способствует снижению уровня СН (Koivisto, Revonsuo, 2007). Напротив же, ожидание определенного объекта (сужение широты категории поиска) упрощает восприятие этого объекта, но затрудняет восприятие объекта другой категории (потенциально релевантного критического объекта) (Puri, Wojciulik, 2008). Целью данного исследования является проверка данной закономерности путем изменения широты диапазона целевого класса. Мы предположили, что, варьируя инструкции, возможно

изменять/расширять класс целевых объектов, тем самым повышая вероятность включения в этот класс критического стимула, что приведет к повышению его релевантности. При этом мы должны получить резкое снижение уровня СН. Для генерации СН была модифицирована динамическая парадигма С. Моста (Most et al., 2001). Стимульный материал предъявлялся в виде окна размером 12,7 см×15,5 см (расстояние до монитора 40–45 см). На сером фоне хаотично двигались, случайным образом сталкиваясь с краями окна, буквы L (по две белые и черные) и T (по две белые и черные) размером 1 см×1 см. На второй сек. просмотра на экране появлялся крест серого цвета, такого же размера. Он проходил по горизонтали справа налево и оставался видимым в течение почти 10 сек. Весь материал предъявлялся в программе SuperLab 4.5. Было проведено три исследования, направленных на разное изменение степени обобщенности инструкции, а именно 1) с помощью логических кванторов исключения и включения, 2) с помощью варьирования степени неопределенности инструкции и 3) с помощью включения в инструкцию признаков критического объекта. При этом предполагалось, что инструкция исключения с квантором «кроме», инструкция, подразумевающая большую неопределенность,

и инструкция, включающая критический стимул в класс целевых объектов, будут способствовать снижению уровня СН, так как увеличивают размер класса объектов, за которыми осуществляется слежение. **Эксперимент 1.** Мы предположили, что введение в инструкцию логических кванторов, задающих различные операции для выделения целевой группы стимулов, приведет к снижению либо повышению уровня СН в зависимости от того, задает ли инструкция игнорирование части стимулов и слежение за оставшимися (квантор «кроме») или наоборот – констатацию на стимулах определенного вида и необращение внимания на остальные (квантор «только»). **Выборка.** В эксперименте приняли добровольное участие 30 человек (средний возраст 19 лет), студенты СПбГУ. **Процедура.** В группе 1 испытуемым предлагалось «считать количество ударов о края окна программы только кириллических букв». В группе 2 испытуемые считали «количество ударов всех букв, кроме тех, которые относятся к кириллическому алфавиту». Таким образом, все испытуемые должны были следить за движением 4 букв. **Результаты.** Уровень СН в группе 1 составил 53%. Уровень СН в группе 2–40%. Данный результат не является статистически значимым (критерий хи-квадрат = 0.536, $p > 0.1$). Влияние инструкции с противоположными логическими кванторами на индукцию СН не зафиксировано. **Эксперимент 2.** Предполагалось, что испытуемые с более определенной инструкцией продемонстрируют более высокий уровень СН. **Выборка.** В исследовании приняли добровольное участие 46 человек (средний возраст 18 лет). **Процедура.** Группе 1 предлагалось сосчитать количество столкновений белых букв с краями экрана. После получения инструкции испытуемым группы 1 демонстрировались те буквы, за которыми им предстоит смотреть. Буквы предъявлялись на сером фоне, идентичном фону ролика, индуцирующего СН. Время предъявления букв составляло 600 мс, после чего сразу же начиналось предъявление ролика. Группе 2 давалась инструкция после начала предъявления ролика выбрать один из признаков предъявляемых объектов и сосчитать количество ударов объектов этого типа с краями окна программы. Испытуемых предупреждали, что перед предъявлением видеоролика им на подпороговом уровне предъявят «подсказку», которая облегчит выбор признаков. На самом деле, им на 100 мс предъявлялся пустой экран того же цвета, что и фон ролика, индуцирующего СН. **Результаты.** Уровень СН в группе 1 составил 65%, а в группе 2–60%, что не является статистически значимым

различием (критерий хи-квадрат=0.117, $df=1$, $p > 0.1$). Инструкция различной степени неопределенности не оказывает значимого влияния на уровень СН. **Эксперимент 3.** Задача, индуцирующая СН, была модифицирована с целью приближения признаков критического стимула к обозначенным в инструкции. В данном ролике крест светло-серого цвета, почти идентичный целевым объектам по светлоте, двигался по той же траектории, что и остальные объекты, и так же ударялся о края окна программы. **Метод.** Инструкция группы 1 состояла в подсчете ударов о края окна программы всех «белых» объектов, тогда как испытуемым группы 2 по инструкции следовало считать удары всех «светлых» объектов. Предполагалось, что для группы 2 ключевой стимул окажется более релевантным, чем для группы 1. **Выборка.** В исследовании приняли участие 103 человека (средний возраст 21 год). **Результаты.** Процент подверженных СН в группе 1 составил 61%, а в группе 2–48%. Данный результат не является статистически достоверным (критерий хи-квадрат = 1.874, $df=1$, $p > 0.1$). Повышение релевантности ключевого стимула, задаваемое инструкцией, значимо не снизило уровень СН.

Таким образом, исследование показало, что, несмотря на то, что варьирование инструкции тремя разными способами увеличивало вероятность включения критического объекта в класс целевых, мы не получили статистически значимого различия между группами. Расширение класса целевых объектов и следующее за ним повышение релевантности ключевого стимула не повлекли за собой снижение уровня СН, а значит, скорее всего, принятие решения о включении ключевого стимула в класс целевых происходит по иным законам. Возможным вариантом решения этой проблемы является предположение о том, что в задаче, индуцирующей СН, не происходит как такового выделения класса целевых объектов, так как испытуемый ориентируется только на целевой признак, игнорируя тем самым любой другой объект, не совпадающий с ним (Andrews, 2011). Наши данные подтверждают это предположение.

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СТРУКТУРНЫЕ ЭФФЕКТЫ В РАБОТЕ КОГНИТИВНОГО БЕССОЗНАТЕЛЬНОГО: НЕОСОЗНАВАЕМЫЙ ПРАЙМИНГ ОТСУТСТВУЮЩИМ СТИМУЛОМ

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Экспериментально установлено, что на неосознаваемом уровне возможен сложный анализ поступающего стимула, вплоть до его семантического содержания. Это справедливо в отношении стимулов разных модальностей и характера, а также сложных стимулов (слово-омонимы, двойственные изображения и т.д.). Кроме того, бессознательное легко «работает» с рядами (множествами) стимулов, поступающих последовательно или одновременно. В научном обиходе устойчиво закрепилось представление о сходстве процессов обработки информации на осознаваемом и неосознаваемом уровнях. Однако если это так, то для чего необходимо дублирование? В чем качественная разница между обработкой информации на осознаваемом и неосознаваемом уровнях? Основное отличие, которое в первую очередь обратило на себя внимание исследователей, заключалось в возможности регуляции и контроля. Очевидно, что осознаваемая когнитивная активность находится в динамической зависимости от внимания субъекта, его мотивов, намерений и т.д., в то время как регуляция неосознаваемой когнитивной активности, на первый взгляд, не представляется возможной. Возникло характерное отождествление: неосознаваемые когнитивные процессы = автоматические, осознаваемые = контролируемые когнитивные процессы. Но насколько действительно автоматичны неосознаваемые когнитивные процессы? Волна исследований, посвященных так называемым нисходящим (top-down) эффектам, показала, что неосознаваемые когнитивные процессы оказываются гибкими и зависимыми от стратегических и контекстных влияний (Whittlesea,

Jacoby 1990; Smith 2001; McKoon, Ratcliff 1995; Bodner, Masson, 2001; Kiefer 2007; Агафонов, Куделькина, Ворожейкин, 2010 и др.). Однако в подавляющем большинстве подобных исследований активный характер неосознаваемой познавательной деятельности в основном сводится к количественным характеристикам (регуляции интенсивности воздействия неосознаваемого стимула в зависимости от различных условий). Но исчерпывается ли активность в отношении неосознанно воспринятой информации вопросами количественной регуляции? Возможна ли активная трансформация и организация субъектом неосознаваемой информации? Возможны ли ошибки, иллюзии, эффекты генерации, игнорирование и прочие эффекты, связанные с активным манипулированием субъекта входящими информационными единицами?

Настоящее исследование посвящено поиску ответа на этот вопрос. Цель эксперимента: определить, возможно ли неосознаваемое восполнение слов как целостных структурных единиц опыта на основе неполной информации (Falikman, 2005). Может ли слово с пропущенной буквой, предъявленное на неосознаваемом уровне, быть воспринятым как целое и обнаруживать соответствующие прайминг-эффекты в отношении решения последующих задач? В качестве неосознаваемых стимулов-праймов использовались слова с пропущенной буквой. На месте пропущенной буквы находилась звездочка (пример: красо*а). В качестве тестовых задач использовались слова-метаграммы. Это пары слов, отличие которых друг от друга по написанию заключается в одной букве, вместе с тем данные слова не имеют семантического родства, напр.: машина-малина. Пример целевой задачи-метаграммы: ма*ина. Испытуемые не были осведомлены о том, что имеют дело с метаграммами, и не осознавали двойственность предъявленного целевого стимула. Целевая задача могла быть решена тремя способами: 1. Реакция 1 (достройка слова-метаграммы до слова 1, например, «малина»). 2. Реакция 2

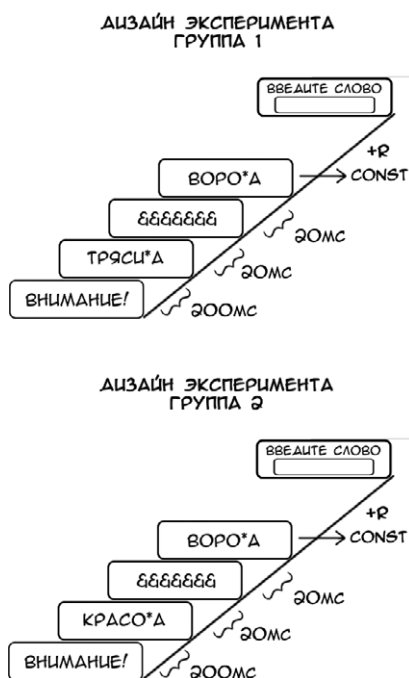


Рис. 1. Дизайн эксперимента (экспериментальная группа 1 и 2).

(достройка слова-метаграммы до слова 2, например «машина»). 3. Достройка до другого варианта (например, до имени «Марина» и т.д.) Перед каждой целевой задачей испытуемому на экране монитора предъявлялось слово-прайм с пропущенной буквой. Условия предъявления исключали возможность его осознания. Отсутствующая буква в прайме (та, которую заменили на звездочку) выступала подсказкой к решаемой задаче. Слово-прайм не было семантически связано с целевым. Основной вопрос заключался в том, будет ли пропущенная в прайме буква увеличивать вероятность достройки целевой метаграммы до слова при помощи этой же буквы. Например, будет ли прайм «тряси*а» увеличивать вероятность достройки

целевого стимула «воро*а» до «ворона», а прайм «красо*а» способствовать выбору «ворота»? Более подробно дизайн эксперимента представлен на рис. 1.

Результаты. Пропущенная буква в неосознанно воспринятом слове-прайме действительно повышает вероятность выбора той же буквы при решении целевой задачи. Это оказалось справедливым для 76% стимулов на статистически достоверном уровне ($p < 0,05$ по критерию χ^2). Следовательно, слово-прайм на неосознаваемом уровне достраивается до целого слова, и буква, которая была «сгенерирована» субъектом при достройке слова-прайма, имеет тенденцию быть выбранной и при достраивании целевой метаграммы. Эффект, аналогичный «эффекту генерации», возможен на неосознаваемом уровне.

Выводы.

В обработке неосознаваемой информации возможны не только эффекты, связанные с изменением степени воздействия той или иной неосознаваемой информации, но и активные эффекты трансформации неосознанно воспринятой информации.

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ИССЛЕДОВАНИЕ ПСИХОСЕМАНТИЧЕСКОГО ПРОСТРАНСТВА ЭМОЦИОНАЛЬНОЙ МИМИКИ С ПОМОЩЬЮ МЕТОДИКИ РЭМ

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Разрабатываемая компьютерная диагностическая методика «Распознавание эмоциональной мимики» (РЭМ) позволяет решать разнообразные исследовательские задачи, связанные

с проблематикой социального взаимодействия, эмоционального развития, профессионализации в сфере помогающих профессий и т.д. (Ениколопов и др. 2006, Осипов и др. 2006, Кузнецова, Чудова 2008а, 2008b, 2010, 2011). Настоящее сообщение посвящено возможностям интерпретации получаемой с помощью РЭМ информации в русле психосемантики.

При работе с РЭМ испытуемый решает задачу последовательной категоризации эмоциональных выражений, возникающих на лицах двух моделей – женщины и мужчины среднего возраста. Мимические выражения соответствуют базовым эмоциям: Гнев, Печаль, Презрение, Радость, Страх, Удивление. Процедура подразумевает, что испытуемый, наблюдая за постепенным изменением выражения лица модели от нейтрального до сильно выраженного эмоционального состояния, останавливает процесс, когда считает, что может уверенно определить, какую именно эмоцию испытывает модель. В качестве ответа испытуемый должен выбрать название эмоции из предлагаемого ему списка категорий: *боязнь, безразличность, вина, возмущение, гнев, злоба, злорадство, недоверие, осуждение, печаль, презрение, радость, раскаяние, страх, стыд, удивление, уныние*. На протяжении выполнения задания порядок слов в списке постоянно меняется (Еникилопов и др. 2011).

В исследовании приняли участие 63 человека в возрасте 18–65 лет, студенты вузов, работники учреждений и научных организаций Москвы. На основе ответов испытуемых была составлена матрица, отражающая применение категорий из списка для называния предъявлявшихся мимических выражений. Факторный анализ показал наличие компактной структуры: четыре выделенных фактора объясняют 80 % вариативности данных. Содержание факторов:

F1 (27% вариативности): *печаль* (-0,953), *вина* (-0,888), *стыд* (-0,879), *раскаяние* (-0,871). Сочетание шкал говорит о состоянии сокрушенности, угнетённости, самоосуждения. Лицо человека при этом можно назвать *смущённым*. К противоположному полюсу оси тяготеют стимулы, характеризующиеся антонимами: гордость, самолюбование, уверенность в себе; лицо человека, испытывающего такие чувства, можно назвать *уверенным*. Условное название – фактор Депрессии-Решительности. Интересно, что если смущенными для наших испытуемых выглядят Печаль (женское лицо, Ж) и Печаль (мужское лицо, М), то выражено уверенными оказываются только мимические выражения мужского лица: Радость М, Удивление М, Страх М и Гнев М.

F2 (25% вариативности): *злоба* (0,940), *гнев* (0,939), *осуждение* (0,797). Положительная корреляция с ним описывает лицо человека, испытывающего сильные отрицательные чувства, направленные на партнера по взаимодействию. В бытовых терминах такое лицо можно назвать *злым*, следовательно, согласно

языковой оппозиции, стимулы, тяготеющие к противоположному концу факторной оси, видятся как *добрые*. Условное название фактора – Агрессия-Принятие.

F3 (16% вариативности): *злорадство* (0,782), *радость* (0,692), *боязнь* (-0,780), *удивление* (-0,720). Согласно Словарю антонимов, противоположным слову «страшный» является «нестрашный», слову «удивительный» – «обыкновенный». Сочетание положительного эмоционального состояния (*злорадство, радость*) с отсутствием переживания угрозы и новизны может быть интерпретировано как довольство; поэтому стимулам, находящимся близко от этого полюса F3, можно дать название *довольные*, тяготеющим к противоположному полюсу – *напряжённые* (безрадостное удивление в сочетании со страхом). Фактор может получить название Тревоги-Благополучия.

F4 (12% вариативности): *безразличность* (-0,938), *недоверие* (-0,932), *презрение* (-0,803). Сочетание шкал подразумевает, что субъект на основе составленной оценки партнера реализует стратегию, направленную либо на отвержение, прекращение контакта, отталкивание (и тогда его лицо выглядит как *отталкивающее*), либо на поддержание контакта, привлечение (тогда его лицо должно восприниматься партнёром как *привлекательное*). Условное название – фактор Враждебности-Дружественности. В положительной зоне располагаются объекты: Радость Ж, Радость М, а также Печаль Ж и Гнев М. Вполне понятно, что лицо человека, испытывающего радость, вызывает симпатию. Более неожиданным является расположение здесь же образа печальной женщины: по видимому, в женском варианте данное эмоциональное состояние для партнера по общению служит сигналом об отсутствии враждебных тенденций. «Дружественность» же мужской мимики гнева представляется труднообъяснимой и требует более развернутого исследования.

Таким образом, при решении задачи категоризации эмоциональной мимики с использованием предлагавшегося списка терминов наши испытуемые продемонстрировали существование четырех семантических конструкторов, опосредующих перцепцию эмоциональной мимики: Депрессии-Решительности, Агрессии-Принятия, Тревоги-Благополучия, Враждебности-Дружественности. Любое мимическое выражение может быть описано в терминах, соответствующих содержанию данных факторов. Зафиксированы различия в семантике некоторых мимических выражений в зависимости от гендерной принадлежности модели.

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НЕЙРОНЫ ФРОНТАЛЬНОЙ КОРЫ СПОСОБНЫ ОПРЕДЕЛЯТЬ КАЧЕСТВО ПОДКРЕПЛЕНИЯ В УСЛОВИЯХ ВЫБОРА РАЗНОГО ПО ЦЕННОСТИ ПОДКРЕПЛЕНИЯ

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Анализу функциональной роли фронтальной коры в организации целенаправленного поведения посвящено большое число работ (Murray et al., 2007 и др.). В ряде работ было показано, что нейроны дорзолатеральных отделов префронтальной коры могут кодировать будущие действия (Asaad et al., 1998; Hasegawa et al., 1998), ожидание зрительных стимулов (Rainer et al., 1998; Watanabe et al., 2006) и награды (Kobayashi et al., 2002; Leon et al., 1999), время наступления подкрепления (Roesch, Olson, 2005a, Tsujimoto, Sawaguchi, 2005). Нейроны дорзолатеральной префронтальной коры изменяли свою активность при ожидании количества и качества подкрепления (Kobayashi et al., 2002; Leon et al., 1999; Roesch, 2003, Wallis et al., 2003)]. Вместе с тем остается неясным, как именно происходит кодирование информации о подкреплении на уровне нейронных сетей. В наших экспериментах мы использовали метод мультисклеточной регистрации из области фронтальной коры у кошек в поведенческой задаче с «активным» выбором подкрепления разной ценности. Животным предлагался выбор подкрепления – низкокачественного (хлеб с 30%-ным содержанием мяса) или высококачественного (кусочки мяса по 5г). Если животное совершало коротколатентное инструментальное нажатие педали во время 2-й или 3-й секунды после включения условного раздражителя – света, то получало низкокачественное подкрепление. При нажатии на педаль

на 9–10с (длиннолатентное нажатие) животному подавалось высококачественное подкрепление – мясо. Пяти кошкам в операциях под наркозом были вживлены пучки полумикроэлектродов, состоящие из двух нихромовых проволок диаметром 50 мкм в заводской эмалевой изоляции в область фронтальной коры (дорзофронтальная кора, поле 8 (F 26–30; L 3–4; H 5,7–13) [Reinoso-Suarez, 1961; Jasper et al., 1954; Snider et al., 1961]). Мы анализировали перистимульные гистограммы активности отдельных нейронов, выделенных из мультисклеточной записи.

В одной микрогруппе можно было выделить от 3–6 нейронов, регистрация одной микрогруппы была возможна от 5 дней до одного месяца. Процедура выделения спайков отдельных импульсных рядов нейронов из мультисклеточной записи включала сортировку спайков по форме, анализ принципиальных компонент спайков, анализ интервальных гистограмм полученных импульсных рядов. В результате статистического анализа перистимульных гистотграмм мы обнаружили, что нейроны фронтальной коры в пределах одной и той же микрогруппы (зарегистрированные под одним электродом) проявляли специфические паттерны активности, сопряженные с разными событиями в поведении животного. Эти паттерны у одного и того же нейрона в группе могли отличаться в зависимости от реализуемой животным поведенческой реакции и от получаемого подкрепления. В одной микрогруппе нейронов могли быть клетки, которые связаны с ожиданием подкрепления, и при получении более ценного подкрепления их реакция была более выражена (по частоте разрядов и длительности возбуждения), чем при

получении менее ценного подкрепления. Этот специфический паттерн реакции каждого нейрона сохранялся на протяжении всего периода регистрации локальной группы клеток. Можно предположить, что животные в условиях выбора различного по пищевой ценности подкрепления

настроены на получение более ценного подкрепления, что определяется специфической активностью нейронов фронтальной коры, включенных в одну сеть.

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ПОЛОВЫЕ ОСОБЕННОСТИ ПРОСТРАНСТВЕННО-ВРЕМЕННОЙ ОРГАНИЗАЦИИ БИОЭЛЕКТРИЧЕСКОЙ АКТИВНОСТИ МОЗГА В ПРОЦЕССЕ ПРОСЛУШИВАНИЯ МУЗЫКИ РАЗНОЙ ЭМОЦИОНАЛЬНОЙ ОКРАШЕННОСТИ

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На рубеже XXI века значительно возросло количество психофизиологических исследований сложных форм когнитивной деятельности. Музыка как результат внутренне мотивированного творческого процесса всегда привлекала особое внимание исследователей. Сегодня очень активно идет изучение процессов сочинения музыки, процессов ее мысленного воспроизведения и др. (Павлыгина 2003, Сахаров 2001). Но вопросы, связанные с особенностями восприятия музыки людьми разного возраста и пола, как нам кажется, освещены очень фрагментарно.

Цель исследования: изучить особенности пространственно-временной организации биоэлектрической активности мозга у мужчин и женщин при прослушивании музыки разной эмоциональной окрашенности.

Материалы и методы. В исследовании принимали участие 40 человек (20 юношей и 20 девушек) в возрасте от 20 до 22 лет, без специального музыкального образования. Все обследуемые были правшами. Электроэнцефалограмма (ЭЭГ) регистрировалась монополярно с объединенным ушным электродом от симметричных отведений затылочных, теменных, центральных, лобных, передневисочных, височно-теменно-затылочных. Локализация отведений определялась по международной системе «10–20», височно-теменно-затылочных – по методу Бетелевой Т.Г. (1983). ЭЭГ регистрировали в состоянии спокойного бодрствования и во время прослушивания музыки. В качестве расслабляющей музыки использовался фрагмент композиции «Теплый летний вечер» (муз. С. Намин),

рок-музыки – композиция «Sword of the Witcher» группы «Vader» (муз. и сл. Piotr Wiwczarek). Компьютерная обработка полученных данных осуществлялась методом корреляционного анализа. Исходным материалом служили безартефактные отрезки ЭЭГ длительностью 70 секунд. Основным анализируемым параметром пространственно-временной организации электрической активности (ЭА) был максимум оценки функции когерентности (КОГ) ритмических составляющих биопотенциалов для внутрислобных (30) и межполушарных (6) пар одноименных отведений. Статистическая обработка полученных результатов проводилась с использованием непараметрического критерия Вилкоксона. Учитывались только достоверные изменения функции КОГ ($p \leq 0,05$) в диапазоне частот: альфа – 8–13 Hz; бета – 13–30 Hz; тета – 4–8 Hz.

Результаты. В диапазоне альфа-колебаний, при переходе от состояния спокойного бодрствования к прослушиванию расслабляющей музыки, достоверные изменения КОГ у мужчин были зафиксированы только в левом полушарии, тогда как для женщин картина перераспределения ЭЭГ-коррелятов носила более сложный характер. У всех обследованных отмечено значимое снижение синхронной активности между затылочной и височно-теменно-затылочной областями левого полушария, а у женщин – сходные процессы регистрировались только в правом полушарии. Подобные результаты свидетельствуют о разобщении в работе затылочных и заднеассоциативных отделов коры (M. Hirshkowitz 1978). При восприятии музыки основная работа по распознаванию и категоризации поступающей информации связана с височной корой, в этих областях мозга происходит значительное снижение доли альфа-колебаний. Нарастание асинхронных процессов в затылочных областях правого полушария у

женщин, по-видимому, говорит о меньшей степени асимметрии женского мозга по сравнению с мужским, что было отмечено в исследованиях А.Г. Моренко и др. (2010: 360). Восприятие рок-музыки сопровождалось сходными изменениями в области альфа-диапазона. По всей вероятности, прослушивание любой музыки, вне зависимости от эмоциональной окрашенности, приводит к усилению асинхронных процессов в затылочных областях коры больших полушарий. Это согласуется с выводами М. Hirshkowitz (1978), утверждающими, что в процессе прослушивания музыки людьми без профессионального музыкального образования наблюдается активация нижнетеменных областей коры.

Более сложным характером перераспределения ЭЭГ-коррелятов сопровождалось восприятие расслабляющей музыки в области бета-диапазона. При этом наибольший интерес, по нашему мнению, представляет изменение уровня взаимодействия между лобными и теменными отведениями. У мужчин в обоих полушариях зарегистрировано снижение пространственной синхронизации в этих областях коры, а у женщин внутри левого полушария отмечался рост значений КОГ. Десинхронизация в работе передне- и заднеассоциативных зон коры, как подчеркивают А.Г. Моренко и др. (2010), может коррелировать со снижением процессов активации памяти, скорости выполнения пространственных задач и других видов когнитивной деятельности. Усиление синхронной активности с лобными отделами коры связано с формированием эмоционального ответа. Известно, что яркие позитивные эмоции проявляются в повышении функции КОГ в передних областях левого полушария (Русалова 1987: 940). Результаты когерентного анализа ЭА в диапазоне бета-колебаний указывают на значительные перестройки синхронизации в височной области коры левого полушария вне зависимости от эмоциональной окрашенности прослушиваемой композиции, как у мужчин, так и у женщин. Подобные изменения могут быть связаны с участием этих зон в

процессах восприятия ритма и других сложных музыкальных характеристик, таких, как мелодия. Вероятно, высокие значения КОГ между височными и центральными областями коры контролируют модуляцию двигательной активности в процессе усвоения ритма слушателем (Уэйнбергер 2005: 32–42).

В диапазоне тета-колебаний при прослушивании каждой из композиций происходили перестройки, имеющие ряд общих черт. У мужчин в обоих случаях отмечалось повышение пространственной синхронизации в заднеассоциативных отделах правого полушария. У женщин, наоборот, все наиболее значимые изменения были зарегистрированы в передних отделах левой гемисферы. Полученные результаты отчасти согласуются с исследованиями Н.В. Вольф и др. (2003: 43–48) показавшими, что для женщин при аудиальной сенсорной нагрузке характерны более высокие показатели КОГ биопотенциалов тета-диапазона с формированием «фокуса» повышенной активности во фронтальных отделах коры преимущественно левого полушария.

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ПСИХОЛОГИЧЕСКИЕ РЕЗЕРВЫ АКТИВНОГО ДОЛГОЛЕТИЯ

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Целью нашей работы стало изучение психологических резервов, используемых в процессе старения человека. Были проанализированы данные анамнеза и психологическое тестирование 163 человек в возрасте от 65 до 98 лет (средний возраст – 79,97 лет). Из них мужчин – 43. В выборку входили

пациенты без выраженного когнитивного дефицита.

Исследование проводилось на базе городско-геронтологического медико-социального центра Санкт-Петербурга (терапевтическое отделение). Был проведен анализ данных анамнеза и психологическое тестирование пациентов. Всего было обследовано 163 человека обоих полов в возрасте от 65 до 98 лет (средний возраст – 79,97 лет).

Изучение уровня креативности проводилось по методике Туник Е. Е., выраженности интринсивных религиозно-психологических установок по Дж. Кассу, признаков измененных состояний сознания по опроснику ИМЧ РАН, напряженности базовых психологических защит по Р. Плутчику-Л.И.Вассерману с соавт., а также оценивались их взаимосвязи с итоговыми индексами реактивной (по Н. А. Курганскому) и личностной (по Л. И. Вассерману) невротизации.

Статистическая обработка данных проводилась методом факторного анализа (см. табл.). В результате психологического исследования полученные данные установили, что религиозность (фактор 1), креативность (фактор 2) и измененные состояния сознания (фактор 4) образовали отдельные, самостоятельные факторы. Это указывает независимость проявлений этих видов духовной жизни человека друг от друга и от уровня невротизации человека. Уровень выраженности интринсивных религиозно-психологических установок зависел от пола респондента (фактор 1). В своем большинстве женщины были более религиозны, чем

мужчины. Возможно, это объясняется эволюционно закрепленным более агрессивным и независимым стилем поведения мужчин в обществе. Эти данные соответствуют предыдущим исследованиям нашей лаборатории, где была показана связь религиозности с возрастом респондентов. Обнаружена положительная связь уровня образования и религиозности человека (фактор 1). Вероятно, это можно объяснить тем, что люди, более склонные к умственному труду, более активны на поле духовного поиска.

Все индексы по креативности образовали один, независимый фактор (фактор 2). Это соответствует данным, полученным на молодой популяции, в том числе, в ходе апробации данной методики. Этот вывод важен в методологическом отношении, так как указывает на возможность (и необходимость) изучения творческих способностей у лиц геронтологического возраста.

Выявлена прямая корреляция вербальной, образной и предметно-бытовой креативности между собой и с общей оценкой творческих способностей (фактор 2), что указывает на взаимосвязь различных видов креативности между собой. Креативный человек часто креативен во всем, в большом и в малом, в высоком и повседневном.

Уровень творческих способностей прямо не зависел от возраста (фактор 2). При этом была обнаружена довольно четкая дискриминативная граница между «креативными» и «не креативными» респондентами. Это соответствует зарубежным данным, которые указывают на то,

ФАКТОР	1	2	3	4
ПС	-0,27	-0,18	0,68*	-0,16
ИСС	0,11	0,08	0,12	0,88*
УН	-0,10	0,02	-0,79*	-0,33
Л	-0,59	-0,18	-0,64	0,03
РЕЛ	-0,66	-0,18	-0,48	0,04
ИЖС	0,38	-0,03	0,57*	0,41
ВОЗР	-0,48	-0,42	-0,06	0,10
ПОЛ	-0,81*	-0,09	-0,10	-0,18
ОБР	-0,89*	-0,10	0,06	-0,11
ПБК	0,09	0,66*	-0,07	0,15
ВК	0,11	0,78*	0,08	-0,16
ОК1	0,07	0,83*	-0,11	-0,05
ОК2	0,17	0,67*	0,05	0,33
ИК	0,13	0,98*	-0,03	0,03
Expl. Var	3,55	3,47	2,10	1,32
Prp. Totl	0,24	0,23	0,14	0,09

Таблица. Результаты факторного анализа психологических и социально-демографических характеристик у исследованной группы геронтологических больных ($n = 163$).

Примечания. ПС – итоговый индекс реактивной невротизации, ИСС – итоговый индекс выраженности признаков измененных состояний сознания, УН – итоговый индекс личностной невротизации, Л – индекс неискренности, РЕЛ – итоговый индекс выраженности интринсивных религиозно-психологических установок, ИЖС – итоговый индекс напряженности базовых психологических защит, ВОЗР – возраст, ОБР – образование, ПБК – предметно-бытовая креативность, ВК – вербальная креативность, ОК1, 2 – результаты 2-х тестов образной креативности, ИК – итоговое значение уровня креативности; Expl. Var – собственное значение фактора; Prp. Totl – процент объясненной дисперсии. Метод выделения факторов (по столбцам) – главные компоненты, использовано ортогональное вращение матрицы нагрузок Varimax normalized; астериском (*) маркированы факторные нагрузки $\geq 0,55$.

что среди людей, которые всегда отличались творческими способностями, различие между молодыми и пожилыми может быть гораздо меньше или вообще отсутствовать. Это позволяет сделать вывод, что в отдельных случаях креативность можно использовать как зону опоры при проведении психотерапии пожилых.

Реактивная и личностная невротизация имели прямую связь между собой и отрицательно коррелировали с напряженностью психологических защит (фактор 3). Эта закономерность соответствует главной роли психологических защит: преодоление фрустрирующих влияний и тревожных переживаний. Как правило, человек начинает их использовать при усилении стрессовых воздействий.

Измененные состояния сознания были показаны как особая размерность психологической жизни человека (фактор 4), не зависящая от уровня невротизации человека и иных характеристик. Эти данные подтверждают адаптивное значение ИСС, в соответствии с концепцией А. Людвига).

Кроме того, в процессе исследования было сделано следующее наблюдение. Из числа пациентов более старшего возраста наилучшие результаты выполнения тестов, как правило, показывали долгожители, имевшие профессию врача и учителя.

Таким образом, в данном исследовании не было выявлено психологических особенностей долгожителей, напрямую коррелирующих с возрастом пациентов, социальными условиями и соматическими заболеваниями. Однако описанные закономерности показывают необходимость дальнейших изысканий.

В настоящее время в нашей лаборатории проводится генотипирование респондентов по генам серотонинового транспортера, серотонинового рецептора и триптофан гидроксилазы с целью определить биологические предпосылки описанных психологических процессов.

Исследование было поддержано РФФИ, грант 09-06-00012а, и грантом НШ-3318.2010.4.

КОГНИТИВНОЕ И КОМПЬЮТЕРНОЕ МОДЕЛИРОВАНИЕ ПРОЦЕССОВ АНАЛИЗА ИЗОБРАЖЕНИЙ

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Цель предлагаемого подхода – расширение классов обрабатываемых объектов и явлений, повышение эффективности систем обработки информации на основе когнитивных моделей и методов бионики. Общие принципы организации, обеспечивающие более высокую степень универсальности и эффективности, это:

1. Многоуровневая обработка.
2. Иерархия физическая (конструктивная) и гетерархия по управлению.
3. Рекурсивный анализ информации.
4. Оперативная смена «разрешающей способности», т.е. уровней обобщения информации.
5. Адаптация, управляемая текущей информацией, например, областью изображения объекта.
6. Реализуемость на нейронных сетях.

Проводимые физиологами исследования дают огромный материал для гипотез и широкое поле для исследований. В свою очередь, в технике также возникает необходимость в разработке универсальных в смысле применимости к широкому спектру изображений методов анализа,

приближающихся по своим возможностям к зрению биологических систем.

В работе предлагается процесс анализа изображений осуществлять на четырех уровнях, оперативно взаимодействующих между собой (рис. 1).

1. Уровень локального анализа и статистики. Здесь выполняется анализ лучей, исходящих из центрального пикселя окрестности 3×3 или 5×5 , выбор направления смещения анализатора, выделение особых точек и границ площадных объектов. Аналогичным образом выделяются границы цветовых областей. Весь процесс осуществляется с помощью оператора-анализатора локальных областей, основанный на нейрофизиологических моделях сетчатки глаза. Попутно вычисляются статистические и интегральные характеристики этих областей.

2. Уровень фрагментарного анализа и кодирования. На этом уровне осуществляется уточнение параметров структурных элементов (деталей) изображения объекта в условиях зашумленности, затенения или недостаточной разрешающей способности на основе знаний о закономерностях в изображениях объектов заданной предметной области.

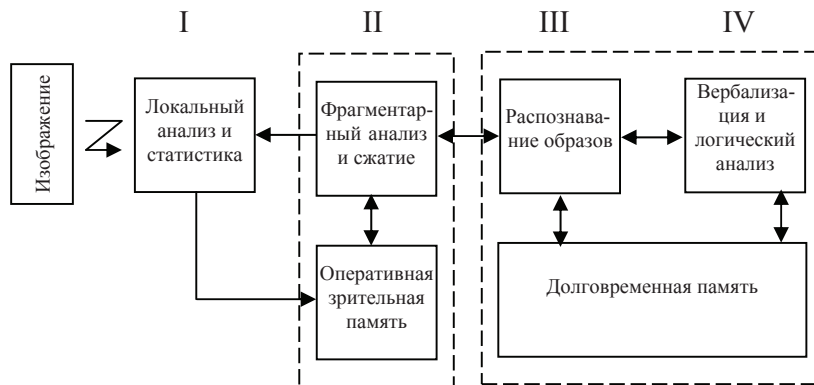


Рис. 1. Когнитивная модель четырехуровневого анализа изображений

Здесь же выполняются операции по сжатию описания изображения: аппроксимация контуров и границ отрезками прямых, дуг, сплайнов; уточнение особых точек (углов и разветвлений) путем экстраполяции лучей, исходящих из особых точек; выделение скелетона и других характерных особенностей и регулярностей. Второй уровень может затребовать смену разрешающей способности или чувствительности анализатора первого уровня на данной области изображения.

3. Уровень распознавания образов основан на построении графа для каждого из объектов изображения. Распознавание графов пространственных отношений заключается в поиске таких связанных подграфов, в которых вершины отображают типовые опорные узлы, а ребра — заданные эталонами связи между ними.

4. Уровень вербализации и логического анализа. Логический анализ пространственных отношений между структурными единицами моделирует рассуждения на нечетком графе, параметры вершин и ребер которого в результате вербализации преобразованы в лингвистические

переменные, принимающие качественные значения.

На рис. 2. показаны результаты компьютерного моделирования этой схемы.

Изображения как источник информации могут быть первичными (например аэро- или космические снимки, видеоряд) и могут быть получены в результате визуализации многомерных массивов данных. Когнитивная модель процесса принятия решений на основе визуальной информации показана на рисунке 3.

Принципы организации системы поддержки принятия решений на визуальной информации:

1. Избирательное восприятие информации.
2. Стержень (скелет) информации как основа стратегии поведения.
3. Целенаправленное поведение и принятие решений.

Работа выполнена при поддержке РФФИ (проекты № 11-07-00632-а, 11-07-00783-а).

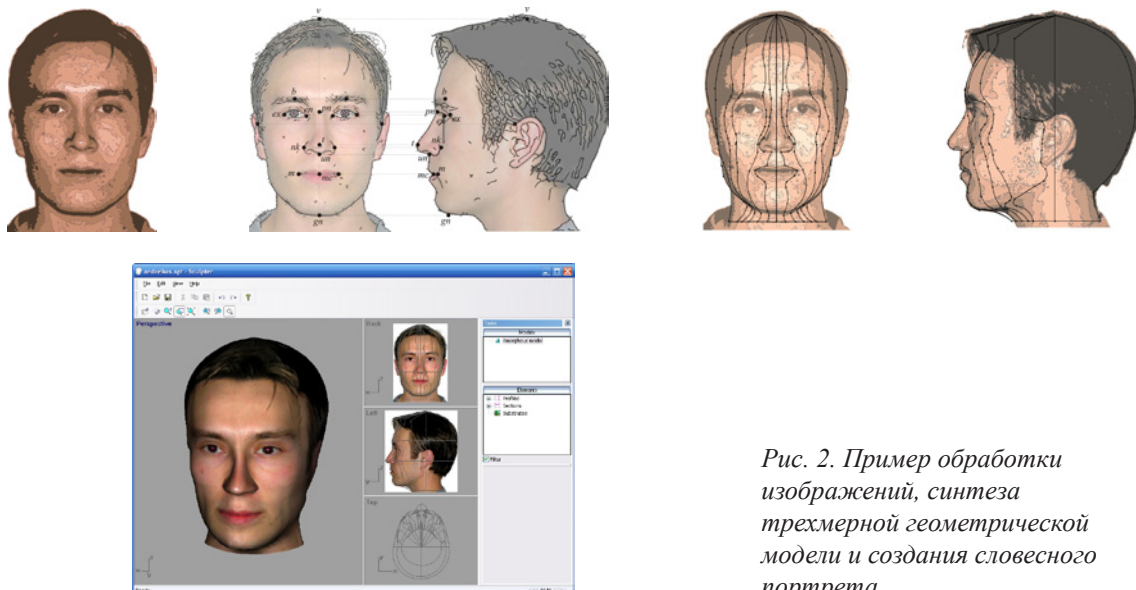


Рис. 2. Пример обработки изображений, синтеза трехмерной геометрической модели и создания словесного портрета

КОГНИТИВНО-СТИЛЕВЫЕ МЕХАНИЗМЫ СОЗНАТЕЛЬНОЙ РЕГУЛЯЦИИ ПОСТТРАВМАТИЧЕСКИХ СТРЕССОВЫХ СОСТОЯНИЙ

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В лонгитюдном исследовании психологических детерминант успешности адаптационного преодоления военными ветеранами боевых действий негативных последствий переживания травматического психологического стресса (Лазебная, 1999; Лазебная, Зеленова, 2007) основные когнитивные стили изучались как механизмы индивидуально-психологического уровня регуляции процесса посттравматической стрессовой адаптации (ПСА). При этом как механизмы субъектно-личностного (социально-психологического) уровня регуляции изучались такие компоненты Я – концепции субъекта, как его самоотношение, самооценка и смысло-жизненные ориентации (Лазебная, Зеленова, 2007; 2008).

Результаты корреляционного анализа показали, что когнитивные стили, обеспечивающие индивидуальную специфичность реализации функции когнитивного контроля при информационном взаимодействии субъекта и среды, в функциональных структурах системы психологической регуляции ПСА тесно связаны с механизмами субъектно-личностного уровня регуляции посттравматических состояний. Такая связь не противоречит природе когнитивных стилей, а подтверждает их специфическую роль в организации взаимодействия субъекта и среды. В целом, когнитивные стили могут рассматриваться как частная форма «индивидуальных *«познавательных стилей»*», которые – как более широкое по объему понятие – характеризуют индивидуально-своеобразные способы изучения реальности» (Холодная, 2002, с. 229). Познавательные стили, в том числе и стили когнитивные, – «это тонкие инструменты, с помощью которых строится индивидуальная «картина мира». В зависимости от степени зрелости лежащих в их основе ментальных механизмов те или иные стили будут способствовать либо

обеднению и субъективации этой картины мира, либо ее обогащению и объективации» (там же, с. 281).

Наибольшее количество значимых корреляционных связей со структурами субъектно-личностного уровня регуляции ПСА образовали стили «полезависимость – полнезависимость» (ПЗ – ПНЗ) и «широта – узость диапазона эквивалентности» (ШДЭ – УДЭ) в невербальной серии методики «Сортировка» (Холодная, 2002). Особенно выраженными оказались функциональные связи всех изучавшихся когнитивных стилей (кроме ригидности – гибкости познавательного контроля) со структурами, определяющими уровень самоотношения субъекта. При этом наиболее тесной была связь между позитивным отношением к своему Я и стилем «широта – узость диапазона эквивалентности» в ситуациях взаимодействия со средой, требующих преимущественно визуального, но не семантического способа кодирования информации. Вместе с тем, так же, как и структуры субъектно-личностного уровня, когнитивные стили в своей функциональной активности оказались не связаны с системой неосознаваемых психологических защит личности, регуляторные функции которой также изучались в данном исследовании.

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ИСПОЛЬЗОВАНИЕ ПОДСКАЗКИ ПРИ РЕШЕНИИ ЗАДАЧ: РОЛЬ ВЕРБАЛЬНЫХ СПОСОБНОСТЕЙ

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История использования подсказок в решении задач восходит к экспериментам К. Дункера и Н. Мэйера, показавшим улучшение эффективности решения задач в случае, если испытуемый получал подсказку. С тех пор в фокусе внимания исследователей были условия использования подсказки в решении задачи: сходство формы предъявления подсказки и задачи, общность процессов кодирования задачи и подсказки, глубина переработки задачи и подсказки и др. Сравнительно мало исследований было посвящено роли способностей в использовании подсказки в решении задач. Из результатов можно отметить, что люди с высоким уровнем креативности показали лучшее использование подсказок в решении анаграмм (Mendelsohn, Griswold, 1964), лучшее использование подсказок, предъявленных на бессознательном уровне (Shaw, Conway, 1990). Однако основная проблема исследований, выявляющих связь когнитивных способностей с феноменами использования подсказок, заключается в преимущественно вербальном характере используемого материала и тестов креативности. В нашем исследовании (Лаптева, Валуева, 2010) было показано, что использование подсказки было положительно связано с показателями Теста отдаленных ассоциаций С. Медника (RAT), но отрицательно связано с общим показателем креативности по тестам «Необычное использование предмета» и Рисуночному тесту творческого мышления К. Урбана. Таким образом, можно предположить, что именно вербальный (а не творческий) компонент RAT был связан с успешностью использования подсказки. С другой стороны, связь эффекта подсказки с вербальными способностями, может оказаться своего рода артефактом, связанным с использованием вербального материала в исследованиях. В таком случае, положительное влияние вербальных способностей на использование подсказки должно исчезнуть при изменении модальности основной задачи.

Для проверки этого предположения мы провели два эксперимента с различной модальностью основной задачи: в первом случае использовалась вербальная дивергентная задача на

составление слов из слова КИНЕМАТОГРАФ, во втором – невербальная дивергентная задача на завершение фигур (кругов). В обоих экспериментах испытуемые решали задачу в 2 этапа, между которыми был перерыв (инкубационный период). Сначала испытуемые в течение 8 минут выполняли основную задачу. Затем, в инкубационном периоде, они работали со стимулами, среди которых встречались подсказки – варианты решения основной задачи. В каждом из экспериментов одна экспериментальная группа (ЭГ) получила подсказки в виде картинок, другая работала со словами, однозначно соответствующими содержанию картинок. Контрольные группы (КГ) в инкубационной задаче работали также либо со словами, либо с картинками, но подсказки были заменены нейтральными стимулами. Стимулы предъявлялись на экране компьютера: с одной стороны был искаженный объект (неправильное слово или перевернутую картинку), а с другой – нормальный объект. Испытуемые должны были нажать на кнопку, в зависимости от того, с какой стороны находился искаженный объект. Время реакции на стимулы фиксировалось. После инкубационного периода испытуемые еще на 8 минут возвращались к решению основной задачи. Помимо экспериментальной процедуры, испытуемые выполняли тесты вербальных способностей: русские версии Теста отдаленных ассоциаций С. Медника и вербальной шкалы теста Р. Амтхауэра. Уровень вербального интеллекта был вычислен как среднее z-оценок по двум тестам.

Мы предполагали, во-первых, лучшее использование подсказок той же модальности, что и основная задача. Во-вторых, если эффекты использования подсказок зависят от модальности, можно ожидать, что вербальные способности помогут в работе с вербальным материалом, но не с невербальным. Альтернативная гипотеза состояла в том, что вербальные способности являются универсальным механизмом, который опосредует эффективность использования подсказки независимо от модальности материала. Роль вербальных способностей в использовании подсказки можно объяснить, если рассматривать их как проявление кристаллизованного интеллекта, который, в отличие от флюидного, отвечает за организацию схем знаний и построение структуры семантической сети (Гаврилова, Ушаков, 2012). В таком случае, обеспечивая эффективное кодирование информации, вербальные способности могут облегчать получение

доступа к элементам, необходимым для решения задачи.

Объединяя результаты Экспериментов 1 и 2, можно констатировать, что в вербальной задаче вербальные подсказки используются эффективнее, чем невербальные (по критерию Манна-Уитни $p=0,045$), в невербальной задаче не различается эффективность вербальных и невербальных подсказок. В инкубационной задаче подсказки перерабатывались иначе, чем нейтральные стимулы. В вербальной задаче время реакции (ВР) на картинку-подсказку было больше, чем ВР на нейтральные картинки ($p<0,001$), а в невербальной задаче ВР увеличивалось для обоих типов подсказок по сравнению с нейтральными стимулами (для обоих типов подсказок $p<0,001$). Различий в точности реакций ни в одном из случаев не было.

В вербальной задаче вербальный интеллект был положительно связан с эффективностью подсказок-картинок ($r=0,28^*$), но не подсказок-слов. В невербальной задаче вербальный интеллект был положительно связан с общей эффективностью подсказок ($r=0,26^*$). В инкубационном периоде для вербальной задачи вербальный интеллект был связан с увеличением ВР на подсказки-картинки ($r=0,537^{**}$), но не был связан с изменением ВР на подсказки-слова в вербальной задаче и на подсказки обоих видов в невербальной задаче (все корреляции рассчитаны при контроле общей скорости реакции).

Обобщая полученные результаты, можно сказать, что вербальные способности были связаны с эффективностью использования подсказок при работе с невербальным

материалом – невербальных подсказок в вербальной задаче, или для обоих видов подсказок в невербальной задаче. Вербальные способности обеспечивают кодирование материала в единый (по всей видимости, семантический) код. В результате задача и подсказка могут быть соотнесены друг с другом, будучи элементами одной сети знаний. В случае вербальных подсказок в вербальной задаче, подсказки являлись буквально ответами, поэтому не требовалось выделять отдельно их значение для того, чтобы они были семантически сопоставлены с основной задачей.

Таким образом, эффективность использования подсказок была связана с возможностью сопоставления подсказок и задачи в единой системе значений, а вербальные способности могут претендовать на роль универсального механизма, обеспечивающего построение этой системы значений.

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ФЕНОМЕН ИММУНИТЕТА К ФУНКЦИОНАЛЬНОЙ ФИКСИРОВАННОСТИ У ДЕТЕЙ

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Функциональная фиксированность – это неспособность человека увидеть латентные свойства предмета в ходе решения задачи. Феномен функциональной фиксированности впервые описан в исследованиях гештальт-психологов (Дункер, 1965; Майер, 1965; Секей, 1965) на материале решения задач, для решения которых было необходимо использование привычных предметов в необычной функции.

В исследовании German & Defeyter (2000), проведенном на американских детях 5 и 7 лет,

был выявлен феномен иммунитета к функциональной фиксированности у пятилетних детей, т. е. у пятилетних детей не проявляются затруднения при использовании предметов в необычных функциях, а у детей 7 лет фиксированность существенно негативно влияет на решение задачи. Остаются неизвестными механизмы формирования функциональной фиксированности.

Гипотетическими механизмами могут выступать особенности созревания отделов головного мозга, отвечающих за исполнительский контроль. Кроме того, как мы предполагаем, ребенок активно социализируется, сталкиваясь с целым рядом культурных запретов.

Целью нашего исследования является выявление влияния запретов и актуального контекста на ход решения задачи на преодоление функциональной фиксированности.

Гипотеза исследования: существует влияние запретов и контекста на решение задачи, требующей преодоления функциональной фиксированности в зависимости от возраста.

Частные гипотезы: 1) Наличие запретов снижает количество правильно решенных задач; 2) Наличие контекста снижает количество правильно решенных задач; 3) Дети 4-х лет лучше справляются с задачами на функциональную фиксированность.

Выборка: 40 человек, поделенные на 2 группы по 20 человек (4 года, 7 лет). Каждая группа в свою очередь поделена на 4 группы по 5 человек, в зависимости от экспериментальных условий (1) без экспериментальных условий, 2) с первым условием (запрет), 3) со вторым условием (контекст), 4) с обоими условиями).

Испытуемым предлагалось решить следующую задачу: на ватмане, с изображенными на нём полем, домом и рекой, расположены четыре игрушки, у каждой в руках по предмету. Требовалось переместить игрушку на другую сторону реки. Правильным решением считалось положить ложку (один из предметов в руках игрушки) через реку, и использовать её как мост для кукол, поскольку это единственный достаточно длинный предмет. Одним из контролируемых условий было наличие запрета на игру с одной из кукол на этапе ознакомления со стимульным материалом, другим условием был способ предъявления предметов и инструкции: ложка могла находиться как в руках куклы, так и лежать в стороне. Так же для усиления функциональной фиксированности, испытуемым сообщалось, что кукла «кушает этой ложкой варенье».

Результаты представлены в приведенных ниже таблицах (Таблица 1, Таблица 2). Следует обратить внимание, что в целом дети 4 лет хуже справились с заданием, в особенности в экспериментальных сериях, т.е. при наличии контекста или запрета, что противоречит гипотезе.

Дети 4 лет	Запрет	Без запрета
Контекст	0	1
Без контекста	0	5

Таблица 1. Распределение правильных решений в группе детей 4 лет

Дети 7 лет	Запрет	Без запрета
Контекст	3	4
Без контекста	5	3

Таблица 2. Распределение правильных решений в группе детей 7 лет

В целом, получены следующие значимые результаты:

1) Установлено значимое влияние запретов на количество правильно решенных задач у детей 4-х лет. 2) Не установлено значимого влияния контекста на количество правильно решенных задач, однако присутствует эффект на уровне тенденции. 3) Дети 4-х лет хуже справляются с задачами на функциональную фиксированность.

В нашем исследовании не обнаружен эффект иммунитета к функциональной фиксированности, описанный в работе German & Defeyter (2000). По всей видимости, функциональная фиксированность связана не с возрастом и происходящим физиологическим и когнитивным развитием головного мозга, а с уровнем освоенности социально закрепленных функций предметов. Например, использованная в исследовании ложка является одним из первых социально закрепленных предметов с четко определенной функцией. Также экспериментальная задача сама по себе несет высокий уровень контекстуальности, так как предъявляется в форме сюжета. Это могло повлиять на каждую пробу в отдельности, изначально задавая дополнительную фиксированность.

Значимое влияние запретов на четырехлетних детей может быть объяснено следующими факторами: а) Сверхзначимость экспериментатора для испытуемых 4 лет. Иными словами, одно только требование взрослого несёт значимую для ребенка установку и серьезно ограничивает его в зоне поиска. б) Поскольку ребенку важно удерживать требование взрослого в рабочей памяти, соответственно, на само решение задачи остается меньшее количество ресурсов.

Неожиданным результатом стал тот факт, что в группе семилетних детей, в особенности по времени решения, получились обратные данные влияния функциональной фиксированности. Так, например, дольше всего дети решали задачи без контекста и без запретов, в то время как наличие запретов и контекста облегчало выполнение задания. Иными словами, они решали более сложные задачи быстрее и эффективнее. Возможно, причиной этому стали особенности

мотивации, т.е. более простые задания либо не вызывали интереса и, как следствие, – неиспользование ресурсов, либо воспринимались как задания «с подвохом» и требовали больше времени на обдумывание.

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УСЛОВИЯ КОМПРОМИССА

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Работа посвящена математическому формулированию условий, на которые соглашаются люди при компромиссных сделках, в том числе при приобретении и/или обмене разнородных материальных объектов.

При моделировании будем рассматривать сделку как обмен ценностями (ресурсами), каждая из которых в глазах участников имеет определенную значимость. Они, безусловно, воспринимаются человеком как сложные семантические стимулы. Будем полагать, что у каждого человека имеется свой индивидуальный конечный набор ценностей, которые находятся в определенной иерархии. Несмотря на то, что восприятие ценностей (ресурсов) – ментальных ли, материальных ли, является субъективным, согласно Ч. Осгуду (1957), каждый человек в каждый момент времени способен дать количественную оценку значимости, поставив отметку на дискретной или непрерывной шкале.

Таким образом, для каждого человека может быть определен (измерен) вектор $t = (t_1, t_2, \dots, t_n)$, где t_i – субъективная количественная оценка значимости i – той из n принимаемых во внимание ценностей. Обдумывающий условия сделки человек способен также дать и субъективную количественную оценку затрат каждого из ресурсов (утрат каждой из ценностей). Таким образом, может быть определен вектор количественной меры затрат этих ресурсов $r = (r_1, r_2, \dots, r_n)$, где r_i – субъективная количественная оценка затрат i – того из n ресурсов при совершении сделки. Заметим, что если даже расходуемый ресурс объективно измерим – время, деньги и др., все равно восприятие их ценности человеком остается субъективным. Тогда субъективная интегральная оценка R утрачиваемых в транзакции

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ресурсов может быть записана в форме скалярного произведения: $R = (t, r) = \sum_{j=1}^n (t_j \cdot r_j)$.

Точно также субъект способен к оценке субъективной меры каждой из приобретаемых в транзакции ценностей, что позволяет получить (измерить) вектор количественной меры приобретаемых ценностей $v = (v_1, v_2, \dots, v_n)$ и субъективную интегральную оценку $V = (t, v)$ приобретаемых в транзакции ресурсов.

Рассмотрим пример, демонстрирующий различие в восприятии набора ценностей для двух субъектов и его влияние на принятие решения при их обмене. Предположим, что субъект **A** обладает набором ресурсов (ценностей) R^a , а субъект **B** обладает своим набором – R^b . Обмен ресурсами между субъектами **A** и **B** возможен только в том случае, если в результате него обе стороны будут считать себя в выигрыше. Таким образом, для обеспечения условий компромисса – обмена ресурсами « a » и « b » между субъектами **A** и **B** соответственно необходимо, чтобы соблюдались условия:

$$(t_b^a, v_b^a) \geq (t_a^a, r_a^a) \quad (1)$$

$$(t_a^b, v_a^b) \geq (t_b^b, r_b^b) \quad (2)$$

где $t_b^a, t_a^a, v_b^a, r_a^a$ – оценки характеристик ресурсов « a » и « b » субъектом **A**,

$t_b^b, t_a^b, v_a^b, r_b^b$ – оценки характеристик ресурсов « a » и « b » субъектом **B**.

Таким образом, при обмене ресурсами компромисс возможен только между людьми, у которых оценки субъективной значимости обмениваемых объектов не совпадают, а компромиссы между субъектами, имеющими сходные интересы, невозможны. Компромиссное решение не обязательно является «справедливым», т.е. таким, когда каждый из участников сделки уверен в равенстве полученной выгоды, т.е. уверен,

что при дальнейшем изменении условий сделки в его пользу она не могла бы состояться. Таким образом, «справедливая» сделка возможна только между сторонами, хорошо осведомленными о представлениях друг друга. Однако, поскольку эти представления в силу субъективности могут быть и иррациональными, то в ходе переговоров можно не только выяснить позицию партнера, но и повлиять на нее.

Обратимся теперь к результатам, полученным Д. Канеманом и его коллегами (2002), которые показывают, что большинство принимаемых человеком решений является интуитивными, а механизмы их принятия схожи с механизмами чувственного восприятия. Одна из основных закономерностей чувственного восприятия, связывающая величину чувственного физического стимула с субъективно воспринимаемой силой его действия, описывается степенным законом Стивенса (1957). Расширим заключение о сходстве интуитивного мышления и чувственного восприятия до гипотезы о применимости степенного закона Стивенса к семантическим стимулам. Положим тогда, что получаемые в сделке ресурсы являются для участников сделки стимулом, а отдаваемые ценности – реакцией. Тогда связь между субъективными интегральными оценками приобретаемых и затрачиваемых ресурсов V и R может быть описана соотношением

$$\left(\frac{V}{V_0}\right)^{-k} = \left(\frac{R}{R_0}\right) \quad (3)$$

Что эквивалентно соотношению (4):

$$R_{\text{payment}} = R_{\text{max}} \left[1 - \left(\frac{V_{\text{requirement}}}{V_{\text{min}}} \right)^{-k} \right] \quad (4)$$

Параметры V_0 и R_0 , V_{min} и R_{max} определены из следующих соображений. Пусть R_0 – это максимальный ресурс R_{max} , которым располагает субъект, который, он из некоторых субъективных соображений, готов потратить (обменять) на приобретение предложенных ему ресурсов, характеризующихся векторами t и v . Значение $V_0 = (t_0, v_0)$ соответствует случаю, когда субъективно воспринимаемая значимость или количественная мера приобретаемой ценности настолько мала, что мы не станем тратить на нее свои ресурсы, т.е. $R=0$. Здесь R_{max} и V_{min} являются скалярными произведениями (t, r_{max}) и (t, v_{min}) соответственно. R_{payment} выражает затрачиваемые субъектом ресурсы на приобретение корзины ресурсов $V_{\text{requirement}}$.

Заметим, что, векторы r и v могут иметь и нулевые компоненты. В частности, если в выражении (4) у каждого из них лишь одна компонента отлична от нуля (простейший случай обмена одного ресурса на другой), то становится очевидным тот факт, что при интуитивной оценке отдаваемый ресурс субъективно оценивается выше, чем приобретаемый.

Для построенной модели содержательная номинация ценностей не имеет значения. А это означает, что за очевидной разницей в поведении людей, исповедующих различные «пакеты» ценностей, могут стоять тождественные психологические механизмы.

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ФОРМИРОВАНИЕ МЕНТАЛЬНЫХ РЕПРЕЗЕНТАЦИЙ И ЭФФЕКТЫ НАУЧЕНИЯ В ЭКСПЕРИМЕНТЕ НАПРАВЛЕННОГО АССОЦИИРОВАНИЯ

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Когнитивная наука значительное внимание уделяет исследованиям ментальных репрезентаций (Т. А. Ребеко, Е. А. Сергиенко) и процессов категоризации (G. Lakoff, F. A. Bleasdale, Н. П. Радчикова) в парадигме индивидуального интеллекта как ментального опыта (К. Oatley, Р. Стернберг, М. А. Холодная). Ментальные

репрезентации оказывают влияние на когнитивный и метакогнитивный анализ поступающей информации. Иными словами, их характер и уровень структурной организации непосредственно определяет когнитивное развитие личности.

Методика организации исследования. Экспериментальное исследование предполагало два этапа. На первом этапе мы изучали ментальные репрезентации студентов. С этой целью была модифицирована схема эксперимента А. Кориата и Р. Мелкмана, известная как модель

«направленного ассоциирования». Согласно инструкции, испытуемые должны были мысленно сгруппировать предъявляемые в случайном порядке слова в триады при условии, что каждое слово одновременно могло входить в триаду видовых понятий (Египет–Междуречье–Китай) и триаду ассоциаций (Египет–Нил–Фараон), что взаимно исключает принцип их формирования и усиливает очевидность выбора способа группировки испытуемыми. Модель эксперимента получила название «Ведущий способ группировки».

В эксперименте приняли участие 70 студентов 2 курса факультета психологии в возрасте от 19 до 22 лет. В результате было обнаружено, что у студентов в среднем понятийный способ группировки ($m=11,9$) доминирует над ассоциативным ($m=4,9$) способом. При обобщении вербального материала они чаще оперируют категориальными, чем тематическими репрезентациями. Так как целью эксперимента была проверка эффективности формирования ментальных репрезентаций, то предполагалось измерить время и правильность выполнения задания, которое по содержанию совпадало или не совпадало со способом группировки. Если способ группировки играет ведущую роль, то задания, сходные с ним по содержанию, испытуемые будут выполнять быстрее и с меньшим количеством ошибок. Поэтому на втором этапе мы сгруппировали испытуемых в две группы: с ассоциативным (19 человек) и понятийным (27 человек) способом группировки, уравнивая их по средним показателям эффективности

формирования триад. Затем каждую группу разделили еще на две подгруппы (10 и 9; 14 и 13 человек).

Оборудование и материалы. Для проведения эксперимента мы использовали набор сходных стимулов, предполагающих формирование понятийных (например, яблоня – дуб – лиственница) и ассоциативных (сад – яблоня – яблоко) группировок. Каждое слово было напечатано на отдельном листке бумаги, комбинируя которые, испытуемый выстраивал определенные инструкции тройки понятий.

Процедура. Половине испытуемых первой группы (с преобладанием ассоциативного способа группировки материала) была предложена «ассоциативная» инструкция: «Объедините (сгруппируйте) как можно быстрее предложенные вам слова по ассоциациям, например, Египет – Нил – фараон (в Египте на реке Нил жил фараон). Когда будете уверены, что работа закончена, скажите «стоп», и экспериментатор выключит секундомер». Второй половине испытуемых первой группы (с преобладанием ассоциативного способа группировки) мы предложили нехарактерную для них «понятийную» инструкцию: «Объедините (сгруппируйте) как можно быстрее предложенные вам слова по понятиям, например, Нил–Евфрат–Хуанхэ (то есть реки). Когда будете уверены, что работа закончена, скажите «стоп», и экспериментатор выключит секундомер».

Аналогично половине испытуемых второй группы (с преобладанием понятийного способа группировки) была предложена понятийная, а

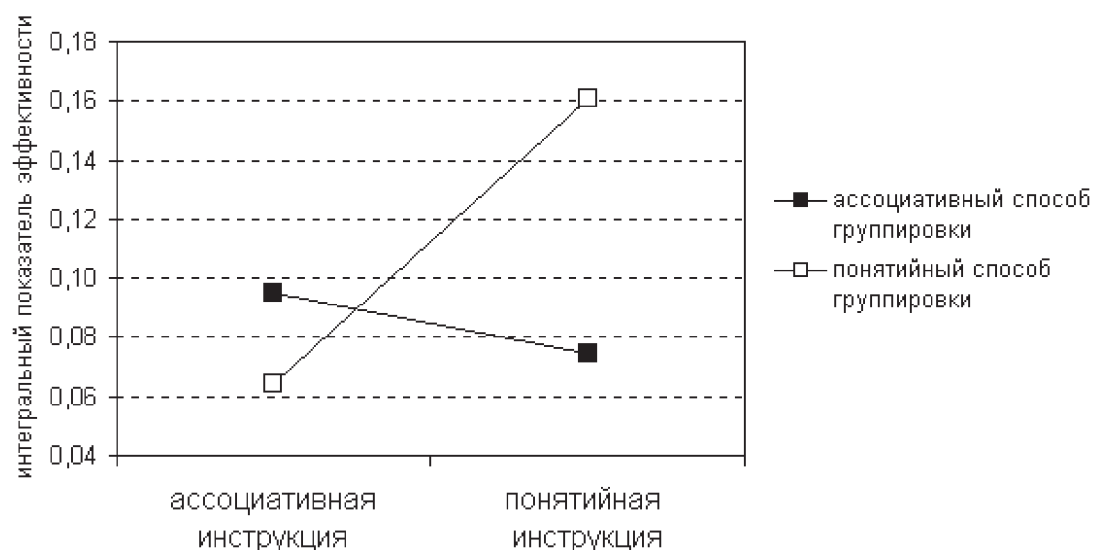


Рисунок 1. Средние значения интегрального показателя эффективности выполнения задания разными группами испытуемых

второй половине – ассоциативная инструкция. Все испытуемые тестировались индивидуально. Время выполнения задания и количество триад, выделенных испытуемыми, экспериментатор фиксировал на бланках ответов. Таким образом, в эксперименте была использована сложная двухфакторная экспериментальная схема 2х2, где независимыми переменными выступали «вид инструкции» и «ведущий способ группировки материала».

Результаты и обсуждение. Для каждого испытуемого был рассчитан интегральный показатель эффективности выполнения задания, учитывающий одновременно и время реакции, и количество сделанных ошибок.

Двухфакторный дисперсионный анализ показал, что получено значимое взаимодействие между переменными «инструкция» и «ведущий способ группировки» ($F(1,41) = 4,75; p = 0,035$). Разные группы испытуемых выполняют разные задания с разной эффективностью. Очевидно, что задания, сходные по содержанию с ведущим

способом группировки, они выполняют быстрее и с меньшим количеством ошибок. Самая высокая эффективность оказалась у группы с ведущим понятийным способом группировки при выполнении задания с «понятийной» инструкцией (рисунок 1).

Результаты исследования позволяют говорить о необходимости учета принципа интеллектуальной конгруэнтности: организации обучения, основанного на адекватном уровне когнитивного развития личности. Когнитивные практики, основанные на стратегиях мышления / обучения, должны соответствовать стратегиям познания обучающихся. Эффективность научения формированию тематических репрезентаций студентов с навыками формирования категориальных ментальных репрезентаций оказалась самой затратной во времени и порождающей наибольшее количество ошибок. Кроме того, можно сделать вывод, что всегда легче учить, чем перечислять.

ВЛИЯНИЕ ФОНА НА ВОСПРИЯТИЕ И ЗАПОМИНАНИЕ ИНФОРМАЦИИ

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Проводится большое количество исследований на восприятие осознанной и неосознанной информации. Цель данного эксперимента: проверить, как irrelevantная (незначимая) информация – фон будет влиять на запоминание. Таким образом, ставится проблема соотношения осознанного запоминания и неосознаваемой обработки фоновой информации; исследуется с точки зрения того, как изменение структуры фона влияет на протекание когнитивных процессов.

В ходе исследования было выдвинуто 2 гипотезы:

1) на фоне с простой информацией запоминание будет более эффективным, чем на фоне сложной информацией.

2) при переизбытке сложной информации в качестве фона человек неосознанно воспринимает ее как верную, даже если информация заведомо ложная.

Как было показано в работе Филлиповой М. Г. (2006), подпороговое предъявление более сложной информации не способствует решению связанных с ней задач, а напротив, ведет к увеличению числа ошибок в этих задачах.

Таким образом, первая часть эксперимента направлена на подтверждение гипотезы о том, что предъявление более сложного фона ухудшает процесс запоминания.

Вторая часть эксперимента основана на эффекте неосознанного негативного выбора. Это явление, которое хорошо описано в работах Аллаhverдова (2000), заключается в том, что человек бессознательно решает задачу, находит правильный ответ и, даже если сознание ошибается, то неосознанно человек знает как ответ, так и место, где ему нужно ошибиться, потому что он ошибается в одном и том же месте.

Выборка: учащиеся старших классов и студенты с нормальной остротой зрения или скорректированным до «нормального» зрением, количество человек 75 (5 групп по 15 человек); в возрасте от 16 до 20 лет, добровольно принявшие участие в эксперименте.

В ходе исследования испытуемым предъявлялся ряд трехзначных чисел (например, 97 4.395.061.432.283.695.874.304.823.479) для запоминания, где фон служил irrelevantной информацией. В качестве фона использовались вычислительные примеры – для подтверждения 1 гипотезы с верным ответом, для 2 – с неправильным. При предъявлении фона с неверными ответами в примерах ряд чисел для запоминания состоял из ответов в этих примерах. Для

затруднения идентификации фона цвет вычислительных примеров будет приближен к цвету фона, а ряд трёхзначных чисел будет чёрного цвета.

Группы:

1 экспериментальная: фон – простые вычислительные примеры ($2+3=5$);

2 экспериментальная: фон – простые неправильные вычислительные примеры ($2+3=6$);

3 контрольная: чистый белый фон;

4 экспериментальная: фон – сложные вычислительные примеры ($13*154=2002$);

5 экспериментальная: фон – сложные неправильные вычислительные примеры ($45*12=678$).

Группы сравнивались по следующим параметрам: время реакции, количество правильно воспроизведенных чисел, количество ошибок.

При обработке результатов было выявлено, что в 1 группе (с фоном, состоящим из простых примеров) было больше ошибок, чем в 4 группе (с фоном, состоящим из сложных примеров), на 40%. При этом количество правильных ответов в обеих группах отличалось незначительно – на 6%.

На основе полученных результатов можно сделать предположение о том, что при наличии дополнительной сложной неосознаваемой информации, когнитивные процессы протекают более эффективно, но при этом время, затрачиваемое на переработку информации, увеличивается по сравнению с простой информацией на подпороговом уровне.

Также был обнаружен факт, заключающийся в том, что при предъявлении фона с простыми примерами количество ошибок не отличалось от количества ошибок в контрольной группе, следовательно, в данной ситуации фон не оказал никакого влияния. А при предъявлении фона со сложными примерами количество ошибок было

значительно меньше по сравнению с контрольной группой (без фона), что показывает сильное влияние фона.

Также мы увидели, что во 2 группе (с фоном, состоящим из простых неправильных примеров) было меньше правильных ответов и больше ошибок (13% и 27% соответственно), чем в 5 группе (с фоном, состоящим из сложных неправильных примеров).

Следовательно, мы можем сделать вывод, что испытуемый мог неосознанно принимать неверные ответы в вычислительных примерах (из которых состоял фон) за верные и таким образом эффективнее воспроизводить ряд чисел. Можно предположить, что даже бессознательно человек может ошибаться (хотя раньше это считалось невозможным) при переизбытке сложной фоновой информации и ограниченном отрезке времени (т.е. в условиях стресса).

В ходе проведения эксперимента было отмечено, что фон влияет на ошибки гораздо сильнее, чем на правильные ответы.

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ОЦЕНКА ПСИХОФИЗИОЛОГИЧЕСКОГО СТАТУСА МЕТОДОМ КАРДИОРИТМОГРАФИИ

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(Архангельск)

Становление и функционирование физиологических систем организма детерминировано генетическими факторами, которые опосредуют определённый морфофункциональный и психофизиологический статус организма

(Крысюк О.Н., 2007). В результате адаптации функциональной системы к когнитивным нагрузкам происходит перестройка ее элементов с переходом на качественно новый уровень функционирования (Безруких М.М., 2006; Евстифеева Е.И., 2007). Ключевой системой в данных приспособительных реакциях является сердечно-сосудистая система, обладающая значительной лабильностью адаптивных реакций. Информативным критерием успешности выполнения различной деятельности

становится динамика хронотропной функции сердечной мышцы. Имеются литературные данные о наличии взаимообусловленности психофизиологических характеристик, типологических особенностей ВНД с механизмами регуляции кардиоритма при когнитивных нагрузках (Краулис А.А., 1982; Манчук В.Т., Солдатов О.Г. и др., 2003). Изучены особенности функциональной асимметрии, степени доминирования моторных центров и динамики вариабельности сердечного ритма (Гук В.Ф., Максименко М.А., 2006). Недостаточно изучена в современных исследованиях степень взаимосвязи соматического развития и психофизиологических функций. Цель нашего исследования – выявить возможность использования ритмографического метода в оценке когнитивных функций.

Проведённые нами исследования на группе детей 7–10-летнего возраста ($n=350$) подтверждают литературные данные о прогрессивном совершенствовании регуляторных механизмов с возрастом и стёртости половых различий в начале периода второго детства. Ритмограммы на коротких промежутках времени (2 минуты) включали в себя записи не менее 150 QRS-комплексов. Регистрация BPC осуществлялась в состоянии спокойного бодрствования, ортостате, когнитивной нагрузке (математический счёт в уме) и в покое после каждого вида нагрузки. Статистический анализ осуществлялся средствами SPSS 17.0.

Независимо от возраста, девочки характеризовались более высоким напряжением сердечного ритма, умеренной тахикардией и функциональной гипертонией, что являлось следствием более высокой мотивации получения положительного результата. Деление обследуемых на группы адаптации по реактивности ВНС в ортостате показало, что дети 7–8 лет с высокими резервами сердечно-сосудистой системы успешнее справляются с когнитивной задачей. Однако медианы индекса напряжения, показывающие степень преобладания центрального контура регуляции над автономным, были выше у детей 10-летнего возраста с хорошими результатами когнитивной пробы: 215 и 120 усл. ед. соответственно. Обширная группа исследований демонстрирует прямую зависимость адаптивных возможностей сердечно-сосудистой системы и успешности обучения в школе (Псеунок А.А., 1994; Шлык Н.И., 2001 и др.). Анализ распределения детей по скоростным и точностным характеристикам выполнения теста Тулуз-Пьерона показал, что дети с высоким уровнем внимания отличались более стабильным,

т.е. менее вариабельным сердечным ритмом, что являлось критерием дезадаптации. Однако школьники, имеющие более высокие значения объёмов кратковременной зрительной и слуховой памяти, выполняли когнитивную нагрузку успешнее и с меньшими физиологическими «затратами», чем их сверстники с низкими показателями. Можно рассматривать два варианта взаимосвязи кардиоритма и когнитивных функций. В первом случае высокие адаптивные резервы способствуют адекватной реакции на когнитивные нагрузки и соответственно высокому качеству их выполнения. Во втором случае высокий уровень развития психофизиологических функций способствует меньшему напряжению регуляторных механизмов кардиоритма. Анализ индивидуально-типологических особенностей реакции сердечно-сосудистой системы на умственную нагрузку демонстрирует зависимость вегетативного гомеостаза от реактивности звеньев регуляции в процессе когнитивной деятельности ($R=0,72$; $p<0,01$). Избыточная активация симпатического отдела ВНС, связанная с незаконченностью морфогенеза блуждающего нерва на начальных этапах обучения ребёнка в школе, определяла динамику временных и спектральных характеристик сердечного ритма. Дети с более высоким симпатотоническим влиянием характеризовались отсутствием значимой динамики в спектральных характеристиках кардиоритма при выполнении когнитивной задачи. В некоторых случаях, при низких адаптационных резервах сердечно-сосудистой системы, наблюдался рост модуляции за счёт сверхнизкочастотной составляющей спектра (VLF свыше 40%), которая рассматривается как индикатор психоэмоционального стресса. Спектральные изменения сопровождаются усилением модуляции сердечного ритма за счёт сверхмедленноволновой составляющей и ослаблением высокочастотных (дыхательных) волн. Подобные изменения носят устойчивый во времени характер, предположительно выполняют компенсаторную роль. Также нами изучено влияние социальных факторов, таких, как степень урбанизации, на напряжённость систем регуляции функции миокарда в процессе когнитивной нагрузки. Результаты данного исследования, проведённого на выборке городских и сельских детей, показывают, что городские мальчики 7-летнего возраста не демонстрируют значимой динамики в процессе когнитивной деятельности. Напротив, их сверстники из сельской местности реагируют на подобную нагрузку 50%-ным ростом модуляции VLF составляющей спектра. Факторный анализ показывает,

что предиктором в данных условиях являются именно адаптационные возможности, которые определяют «цену» когнитивной деятельности.

Изученные нами данные о возрастной динамике вариабельности ритма сердца у группы детей 7–10 лет показывают, что активация ВНС в процессе когнитивной деятельности происходит надсегментарно и с возрастом показатели спектральной мощности не восстанавливаются полностью, демонстрируя «отсроченную» реакцию. Данный факт свидетельствует о специфичности когнитивной деятельности в динамике становления регуляторных механизмов функций сердечно-сосудистой системы. Наше исследование показывает, что использование кардиоритмологического метода может использоваться для выявления психоэмоционального стресса и определения функциональных затрат при осуществлении когнитивной деятельности.

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О СЕМАНТИКЕ МНОГОЗНАЧНОГО ПРИЛАГАТЕЛЬНОГО TRUE

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В лингвистике проблемой семантического анализа занимаются долгое время, на эту тему написано немало работ, однако семантический анализ различных языковых единиц остается актуальным и сегодня.

Как отмечает О. Н. Селиверстова, лингвисты выдвигают большое количество гипотез о сущности языковых единиц и методах их описания. Однако эти гипотезы не всегда раскрывают истинную природу описываемых языковых единиц, поскольку касаются главным образом методики их исследования. Для оценки справедливости выдвигаемых гипотез необходимо применить их к описанию данных в опыте фактов речи [1].

Такая задача ставится и в данном исследовании. В качестве объекта исследования была выбрана многозначная лексическая единица *true* и ее синонимы *loyal* и *faithful*.

Согласно данным Дж. Лича, прилагательное *true* вошло в список 1000 самых употребляемых слов [2].

Тезаурус английского прилагательного *true* включает в себя обширный синонимичный ряд, в который входят и исследуемые прилагательные *loyal*, *faithful*. В словарных статьях прилагательные *true*, *loyal*, *faithful* трактуются через друг друга (см. ниже подчеркнутые части определения): *true* – sincere or loyal [OALD], sincere or loyal, and likely to continue to be so in difficult situations [CALD], *faithful*, as to a friend, vow, or cause; *loyal* [AHDEL].

Таким образом, дефиниции слов, представленные в словарях, не сообщают о различии между синонимами. Следовательно, совпадающие фрагменты в толкованиях предполагают, что данные лексические единицы имеют одинаковое значение и поэтому могут быть взаимозаменяемыми практически в любых контекстах. Рассмотрим следующие примеры, полученные в результате замены прилагательного *true* его синонимами:

Ср.: *Dawson had also been a classmate and was the only other man Sebastian considered a true friend. Dawson had also been a classmate and was the only other man Sebastian considered a loyal friend. Dawson had also been a classmate and was the only other man Sebastian considered a faithful friend.* (Доусон был и одноклассником, и тем

единственным, кого Себастьян мог считать настоящим / верным / преданным другом) [4].

В приведенном примере высказывания, получившиеся в результате замены, оценены носителями языка как правильные, что действительно позволяет утверждать о сходстве их значений.

Однако во многих случаях замена одной из данных лексических единиц на другую приводит к тому, что полученное высказывание оценено носителями языка как неприемлемое.

Ср.: *True love is never lost* – **Loyal love is never lost* (Настоящая любовь не проходит; или *She's since come back and turned into a loyal customer*. **She's since come back and turned into a true customer*. **She's since come back and turned into a faithful customer*. (Она вернулась и стала верным покупателем) [3].

Таким образом, несмотря на семантическую общность, существуют признаки, разграничивающие значения рассматриваемых единиц, что делает их замену в ряде случаев невозможной.

Проведенное исследование семантики позволило выделить ряд семантических признаков прилагательного *true*: оно вносит информацию о том, что объект (X) описывается как принадлежащий к классу некоторых объектов (X-ов), и при этом говорящий (Y) констатирует соответствие X-а существующим представлениям о нем. При этом слово *true* может использоваться в качестве определения к словам, обозначающим:

а) человека, группу лиц, нацию

Например, *He is reputed for a good and true man*. (У него репутация доброго и искреннего человека); *true Brits who drink too much lager* (Настоящие британцы, которые пьют слишком много светлого пива) [3].

б) сферу чувств и эмоций

Jared thought that his wilful daughter had found her true love at last. (Джаред подумал, что его упрямая дочь наконец нашла свою настоящую любовь) [3].

в) абстрактные сущности, свойства, отношения

It is not philosophical knowledge, not true science. (Это не философское знание, не истинная наука) [3].

д) внешность

I said, and at last tore my gaze away from her true blonde charms and her large gray eyes that were now filling wetly. (Я сказал, и наконец, оторвал взгляд от этой очаровательной натуральной блондинки и от ее больших серых глаз, в которых появились слёзы) [4].

е) деятельность человека

This is true leadership. (Именно так и надо руководить) [3].

В вышеприведенных примерах Y, основываясь на своих представлениях о том, каким должен объект, чтобы его можно было отнести к классу X-ов, присваивает X-у соответствующие характеристики этого класса через прилагательное *true*. Y до описываемого момента отождествлял X с членами данного класса, что определяет выбор прилагательного *true*. Анализируемая модель не несет информации о качественной характеристике X-а, а лишь сообщает о выделении X-а из множества подобных X-ов и о соответствии X-а представлениям о нем у Y-а.

Полученные результаты показывают, что выбранный путь исследования позволит выявить все условия, необходимые для правильного выбора и употребления языкового знака в речи в определенной денотативной ситуации.

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ЗНАЧЕНИЕ ИНТЕРМОДАЛЬНЫХ ВЗАИМОДЕЙСТВИЙ ДЛЯ ИССЛЕДОВАНИЯ КОГНИТИВНЫХ ПРОЦЕССОВ

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Восприятие, как неоднократно отмечалось в работах многих авторов (С. В. Кравков, Б. Г. Ананьев, Л. М. Веккер, Е. Ю. Артемьева и др.), носит полимодальный характер, что проявляется в целостной взаимосвязи

впечатлений разной модальности и существовании определенного единства, общности ощущений. Известно, что мы почти никогда не воспринимаем осязательные, зрительные и слуховые раздражения изолированно: воспринимая предметы внешнего мира, мы видим их глазом, ощущаем прикосновением, иногда воспринимаем их запах, звучание и т.д. Поэтому одной из задач экспериментального исследования является изучение закономерностей межмодальных взаимодействий, выражающих целостность чувственного отражения человеком объективной действительности, что позволяет познать действительность более глубоко. К таким исследованиям можно отнести те из них, которые касаются различных видов взаимодействия ощущений. Это как довольно редкие факты возникновения ощущения одной модальности в ответ на стимуляцию в другой, традиционно обозначающиеся термином «синестезия» (т.е. реальное соощущение), так и межмодальные связи, присущие опыту каждого человека.

Можно говорить об интермодальном взаимодействии как основе научения в целом. Примером могут служить данные о существовании ряда интермодальных зрительно-слуховых и зрительно-тактильных эффектов. Причем такие эффекты можно наблюдать уже с младенческого возраста. Так в экспериментах Э. Спелке по восприятию речи в координации со зрительно воспринимаемыми событиями младенцам в возрасте примерно 5 месяцев на разных экранах одновременно показывались два обычных, «взрослых» фильма с большим количеством диалогов, причем только один из фильмов озвучивался из динамика, расположенного строго между экранами. Анализ движений глаз детей показал, что они предпочитали смотреть на экран с озвучивавшимся фильмом (Spelke, 1999).

Американский психофизиолог В. Рамачандран обращает особое внимание на «ложные» сенсорные феномены, которые также могут пролить свет на работу ряда когнитивных функций. Так, некоторые пациенты доктора Рамачандрана жаловались, что их фантомные руки или ноги чувствовали «онемение», «парализованность». Часто у таких пациентов и до ампутации рука или нога находилась в гипсе или была парализована, то есть пациент после ампутации оказался с парализованной фантомной ногой, его мозг «запомнил» это состояние. Тогда учёные попытались перехитрить мозг, пациент должен был получить зрительную обратную связь о том, что фантом подчиняется

командам мозга. Сбоку от пациента было установлено зеркало, так что когда он смотрел на него, то видел отражение своей здоровой конечности, то есть он видел две работающие ноги. В результате эксперимента пациент не только увидел фантомную ногу, но и почувствовал её движения. Этот опыт был повторён неоднократно, визуальная обратная связь действительно «оживляла» фантомы и избавляла от неприятных ощущений парализованности. Мозг человека получал новую информацию, что нога двигается, и ощущение скованности исчезало (Рамачандран, 2006).

Другой ряд экспериментальных данных говорит о прямой связи интермодальных взаимодействий с порождением речи, с языком. Г. Бенедетти, констатируя, что человеку (в отличие от животного) присущи интермодальные ассоциации, называет слово первым интермодальным символом: человек научается называть объект, поскольку у него вырабатываются соответствия между зрительными и акустическими образами (Benedetti, 1973).

По мнению Е.Н. Соколова, наличие заложенных в языке синестетических метафор, а также некое фонетическое (а значит, и моторное) родство между простейшими понятиями в разных языках наводит на мысль о том, что язык синестетичен по своей природе (Соколов, 2003). Похожей точки зрения придерживается и В. Рамачандран. Все виды сенсомоторных связей, как считает автор, могут лежать в основе зарождения языка. По его мнению, движения рук при описании или указании на предмет каким-то образом были связаны с движениями речевого аппарата. Каждое движение ротового аппарата приводит к появлению определенного рода звуков, которые сочетаются с наличием предмета в окружающем пространстве. Кроме того, движения при взаимодействии с объектом определенным образом повторяют контуры предмета. Таким образом, образованию нескольких видов синестетических связей мы обязаны возникновением языка. Эта модель была названа синестетической теорией возникновения речи (Ramachandran, Hubbard, 2001).

С помощью языка, речи происходит обобщение, основанное на сравнении предметов при выделении и обозначении через слово их общих свойств. Использование подобных свойств как классификационных предоставляет человеку возможность работать со значительно большим объемом предметов, чем это возможно в прецептивном плане. С помощью речи происходит обобщение и категоризация получаемой органами чувств информации.

Словесное обобщение позволяет привлечь к анализу значения предмета всю систему сложных смысловых связей, отложившихся в языке, и выделить те стороны воспринимаемого предмета, которые оставались бы недостаточно восприимчивыми.

Таким образом, синестетические реакции зависят от семантического содержания, от значения. Этот факт, тем не менее, плохо согласуется с традиционным пониманием синестезии. Об этом свидетельствуют и данные наших экспериментов, где было показано, что при возникновении ощущения интермодального сходства определяющими являются не непосредственно воспринимаемые, модально-специфические (физические) характеристики объектов, а характеристики, носящие неспецифический характер и имеющие эмоциональную основу, что проявляется в сходстве этих объектов на семантическом уровне. Данные были получены при анализе качественно различных стимулов: цвет и форма, музыкальные отрывки, графические рисунки, вербальные обозначения (осуществлен полный круг межмодальных переходов). То есть наряду со смысловым использовался максимально неозначенный материал. Подобное сравнение подтвердило существование одного и того же механизма обобщения (Лупенко, 2009, 2011).

Выводы:

1) Синестезия, или интермодальное взаимодействие, в широком смысле слова имеет существенное значение помимо самого явления как такового для изучения механизмов, сопровождающих когнитивную деятельность человека в целом, в том числе для изучения восприятия, возникновения и эволюции языка, понимания таких трудных феноменов, как абстрактное мышление, метафора.

2) Можно говорить о всё увеличивающемся количестве фактов, свидетельствующих о том, что в основе одного из способов связывания впечатлений разной модальности лежит перенос значения, общего когнитивного референта этих впечатлений, с помощью которого происходит обобщение и категоризация получаемой органами чувств информации. То есть при сопоставлении объектов разной модальности человек оперирует не их модально-специфическими характеристиками, а значениями этих объектов.

3) Можно предположить, что интермодальное взаимодействие, в основе которого лежит когнитивный механизм обобщения, категоризации, может использоваться для оценки и структурирования всех психических явлений и в том числе при решении различных когнитивных задач, что требует своего дополнительного изучения.

ПОЛОВЫЕ РАЗЛИЧИЯ В РЕГУЛЯЦИИ ЭМОЦИОНАЛЬНЫХ РЕАКЦИЙ ПРИ ПРЕДЪЯВЛЕНИИ ТЕКСТОВ, СОДЕРЖАЩИХ СЦЕНЫ НАСИЛИЯ

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Одним из актуальных направлений в рамках изучения копинг-стратегий является исследование эффективности способов снижения эмоционального напряжения путем раскрытия эмоций (Pennebaker J. W. et al. 2004; Mendes W. B. et al. 2003).

Как показали результаты некоторых предыдущих исследований, не все способы раскрытия эмоций оказывают позитивное влияние на состояние психического и физического здоровья человека (Brosschot J. F., Thayer J. F. 2003; Martin R. B., et al. 1993; Gross J. J., Levenson, R. W. 1993). Значительную роль играют индивидуальные различия и индивидуальный стиль поведения (O'Connor M. F. et al. 2005;

Larsen B. A., Christenfeld N. J. S. 2011). Вместе с тем, исследований половых различий в физиологических механизмах при раскрытии эмоций почти не проводилось (Faber S. D., Burns J. W. 1996).

Целью настоящей работы было исследовать половые различия в интенсивности эмоциональных реакций в зависимости от когнитивного раскрытия эмоций (их детализации и анализа) в ответ на предъявление текста, содержащего сцену насилия (Davydov D. M., Lysenko N. E. 2009).

В исследовании участвовали 56 испытуемых (30 женщин) без психических расстройств, средний возраст 24,8 (SD=2,9) лет.

Регистрация вегетативных показателей включала измерение реактивности частоты сердечных сокращений при экспираторной пробе Вальсальва. Для оценки валентности эмоций и сопутствующей активации мы использовали специально разработанный «когнитивный» опросник, который одновременно служил

инструментом когнитивного раскрытия эмоций (Лысенко Н. Е., Давыдов Д. М. 2011).

Для целей настоящего исследования от испытуемого к испытуемому варьировался порядок заполнения когнитивного опросника и регистрации показателей активности сердечно-сосудистой деятельности, т.е. у половины испытуемых после предъявления текста в первую очередь регистрировались вегетативные показатели, а после этого они заполняли «когнитивный опросник», вторая половина испытуемых после предъявления текста в первую очередь заполняла «когнитивный опросник» и только после этого у них измерялись вегетативные показатели.

Результаты исследования демонстрируют, что динамика вегетативных показателей и оценки по «когнитивному» опроснику варьировались в зависимости, с одной стороны, от пола испытуемых, с другой стороны — от порядка измерения показателей сердечно-сосудистой деятельности и когнитивной оценки текста.

У женщин реактивность частоты сердечных сокращений при экспираторной пробе Вальсальва была выше, чем у мужчин, в условиях, когда вегетативные показатели измерялись сразу после предъявления текста, что свидетельствует о большей аффективной вовлеченности женщин уже на стадии предъявления (восприятия) текста.

Группы мужчин отличались по показателю шкалы «неприятный — приятный» — текст казался более неприятным, когда заполнение когнитивного опросника мужчинами было отсрочено, чем когда заполнение проводилось сразу после его прослушивания. Также при заполнении когнитивного опросника сразу после предъявления текста мужчинам он казался менее неприятным, чем женщинам. Эти результаты свидетельствуют о том, что у мужчин, в отличие от женщин, не само прослушивание текста, а только заполнение опросника с оценкой этого текста, т.е. когнитивное раскрытие содержания текста, усиливало аффективную вовлеченность в его содержание.

Результаты настоящего исследования могут быть объяснены следующим образом. У мужчин

при предъявлении текстов задействуются в основном области когнитивной обработки информации, ответственные за контроль эмоциональных реакции путем их подавления. Вероятно, что в этом случае заполнение «когнитивного» опросника сразу после предъявления текста является специфическим инструментом для раскрытия подавленных эмоций.

У женщин в отличие от мужчин улавливание эмоционального контекста и когнитивная оценка валентности содержания текста, возможно, происходят одновременно в ходе его предъявления, о чем свидетельствуют показатели вегетативных реакций и ответы на «когнитивный» опросник сразу после прослушивания текста.

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ВОЗРАСТНЫЕ ОСОБЕННОСТИ СЕЛЕКТИВНОГО СЛУХОВОГО ВНИМАНИЯ У ДЕТЕЙ 4 И 5 ЛЕТ

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Результаты исследований, посвященных проблеме обнаружения и распознавания звуковых сигналов, особенно в условиях восприятия нескольких звуковых потоков, позволяют предполагать, что решение этих задач в значительной степени зависит от индивидуальных особенностей селективного слухового внимания. Как известно, селективное внимание представляет собой весьма динамичный процесс, степень выраженности флюктуации которого зависит от устойчивости произвольной регуляции внимания, индивидуальной мотивированности, работоспособности и процессов срабатывания. Эти характеристики, определяемые в ситуации психоакустического эксперимента, отражают состояние процессов регуляции слухового внимания и адаптивных возможностей блока регуляции высших корковых функций (Лурия А. Р., 1973). Активная организация систем селективного внимания у детей происходит преимущественно в дошкольный период, в возрасте 4–6 лет (Люблинская А. А., 1971). Большинство существующих немногочисленных публикаций по этому вопросу посвящено зрительному вниманию. В связи с этим представляется весьма актуальным изучение становления селективного слухового внимания в этот возрастной период. Ранее, в работе (Королева И. В. с соавт., 1998) было показано наличие значимых возрастных различий при обнаружении слов на фоне шума у детей 4–6 лет, что проявлялось в уменьшении числа ошибок с возрастом. Предполагалось, что одной из возможных причин этого явления может быть состояние селективного слухового внимания.

Для проверки этой гипотезы нами выполнено сравнительное исследование слухового внимания у детей двух возрастных групп: условно «младшая» – средний возраст – 4г 6мес – 31 ребенок и «старшая» – 5л 6мес – 30 детей. Все дети не имели нарушений слуха и интеллекта, посещали детский сад общего типа.

На первом этапе работы проводились два психоакустических эксперимента, в ходе которых

дети должны были, прослушивая последовательность слов, обнаружить заданные целевые слова, реагируя нажатием на клавишу мыши. В качестве речевого материала использовались 24 разных слова, произнесенных диктором – мужчиной (существительные единственного числа именительного падежа, двухсложные с ударением на первом или втором слоге, подобранные с учетом возрастной адекватности). Из них в случайном порядке формировались две тестовые последовательности. Первая – общим числом 125 предъявлений, из них – 16 целевых слов, и вторая – 126 предъявлений – 17 целевых слов. В первом эксперименте, «медленном» (Т 1), интервал между концом предыдущего слова и началом следующего составлял 1500мс, целевое слово – «ДЯДЯ». Продолжительность опыта составляла 4–4.5 мин. Во втором, «быстром» (Т 2), – 500мс и «БАТОН» соответственно, продолжительность 3–3.5 мин. Количество фоновых слов между целевыми стимулами в случайном порядке менялось от 5 до 9 слов. В ходе проведения экспериментов регистрировались ответы испытуемых и время задержки ответа на целевой стимул, измеряемое от момента начала звучания слова.

На втором этапе проводился эксперимент (Т3) по измерению простых сенсомоторных реакций испытуемых – времени задержки реакций на обнаружение звукового сигнала (ЗРО). Тестовая последовательность состояла из 31 сигнала (тон 1000Гц, длительность 500мс). Каждый последующий стимул предъявлялся после фиксации реакции испытуемого – нажатия клавиши мыши – через интервал времени, изменяющийся в случайном порядке в пределах от 500мс до 3500мс.

Подготовка стимулов, проведение экспериментов, регистрация ответов и времени задержки ответов осуществлялись с применением персонального компьютера и специализированного пакета программ. Статистическая обработка данных проводилась с помощью пакета программы Excell. При обработке результатов экспериментов вычислялись средние по группе значения времени задержки ответа (ВЗО), количество пропусков целевого слова (КП) и ложных срабатываний в пересчете на одного ребенка, достоверность различия средних по Т-тесту, коэффициент линейной корреляции.

	*Количество ложных срабатываний		*Количество пропусков		**Время задержки ответа, с	
	Младшая группа	Старшая группа	Младшая группа	Старшая группа	Младшая группа	Старшая группа
T1	3.4	3.3	0.88	0.67	1.42	1.22
T2	0.47	0.5	3.3	2	1.26	1.06
T3					0.83	0.7

Таблица 1.

*В пересчете на одного ребенка **Средние значения по группе.

Результаты трех экспериментов приведены в таблице 1.

Дети старшей группы по сравнению с младшей допускали меньше ошибок и быстрее реагировали на целевое слово как в быстром, так и в медленном эксперименте.

Количество ложных срабатываний составляло незначительную величину от числа фоновых слов и примерно одинаково в обеих возрастных группах. Относительно большая величина их в эксперименте с целевым словом «дядя» обусловлена присутствием среди фоновых слов близкого по звучанию слова «дядел» (86% от числа всех ошибок), во втором эксперименте подобного соответствия слову «батон» не было.

В медленном эксперименте (T1) ответы детей обеих групп статистически значимо не различались ни по ВЗО, ни по КП, в быстром (T2) – достоверно различались по ВЗО.

По сравнению с медленным, в быстром эксперименте в обеих группах наблюдалось достоверное уменьшение ВЗО: в младшей группе – на 11%, в старшей – на 13%, и увеличение КП: в младшей группе – на 275%, в старшей – на 199%.

Время задержки реакции обнаружения в эксперименте T3 достоверно не различалось у групп детей и было существенно короче ВЗО в экспериментах по обнаружению целевого слова (T1 и T2). Для младшей группы выявлена

корреляционная зависимость между ним и ВЗО в медленном эксперименте ($r=0.51$), что свидетельствует о наличии заметной аддитивной составляющей простых сенсомоторных реакций в условиях медленного эксперимента, в отличие от быстрого ($r=0.35$).

Анализ полученных данных свидетельствует о достоверных возрастных различиях в измеренных показателях когнитивного поведения детей, особенно отчетливо проявляющихся в условиях жестко регламентированного по времени эксперимента. Можно предполагать, что они обусловлены в первую очередь различным уровнем сформированности способности к мобилизации резервов произвольного селективного слухового внимания при переходе от комфортных условий выполнения задачи к более сложным. Мобилизацию внимания можно интерпретировать как использование некоторой процедуры свертывания последовательных операций обнаружения звука, его распознавания и принятия решения в последовательно – параллельную схему.

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КОМПЛЕКСНОЕ ИССЛЕДОВАНИЕ ФОРМИРОВАНИЯ НАВЫКА ЧТЕНИЯ У РУССКОЯЗЫЧНЫХ ДЕТЕЙ

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Работа посвящена выявлению связи между уровнем речевого развития детей 4–7 лет ($n=151$) и сформированностью у них навыка чтения. В работе проверяли предположение о

том, что формирование навыка чтения у детей определяется совокупностью взаимосвязанных и взаимозависимых показателей, таких, как возраст ребенка, определенный уровень его речевого развития, зрелость электрической активности мозга, определяемая по выраженности и локализации альфа-ритма.

Общая задача исследования заключалась в выявлении связи между возрастом ребенка, уровнем его речевого развития, сформированностью навыка чтения, функциональной

сенсомоторной асимметрией (ФСМА) и характеристиками электроэнцефалограммы (ЭЭГ). Конкретными задачами исследования явились: описание речевого развития детей 4–7 лет; выявление возраста, в котором дети начинают читать; анализ активного лексикона детей 4–7 лет, находящихся на разных этапах овладения навыком чтения; сравнение спектральных и временных характеристик ударных гласных в словах спонтанной речи и при чтении; выявление возможной связи между сформированностью у детей навыка чтения, сложностью реплик в диалогах и сенсомоторной функциональной асимметрией; характеристика ЭЭГ-картины у детей, находящихся на разных этапах овладения навыком чтения.

В работе использован комплексный подход, включающий акустический, фонетический и лингвистический анализ речи детей, оценку сформированности навыка чтения, определение порогов слуха (методом аудиометрии) и фонематического слуха, ФСМА и регистрацию суммарной электрической активности мозга.

Уровень речевого развития ребенка оценивали на основе анализа активного лексикона по сложности слоговой структуры употребляемых слов, частоте встречаемости речевых ошибок, сложности реплик в диалогах с взрослым, наиболее часто используемым частям речи в репликах. Определяли частотность словаря ребенка посредством разработанной компьютерной программы «Frequency Word Book».

Проверяли способность ребенка к чтению материала разной степени сложности (букв, слогов, слов и фраз) по букварю и тексту сказки «Красная шапочка». Оценивали степень сформированности у детей ориентации на смысл текста и качество понимания слов и фраз, используя процедуру подбора иллюстраций к прочитанным словам и фразам. Четкость произнесения слов при чтении оценивали на основе инструментального спектрографического анализа речевого материала.

Инструментальный анализ речи детей проводили в программе «Cool Pro». Считали временные и частотные (значения частоты основного тона ЧОТ, частоты первой форманты – F1 и второй форманты – F2) характеристики ударных гласных в словах спонтанной речи и при чтении, паузы между слогами в словах при чтении по слогами. Определяли наличие артикуляционных и грамматических ошибок в речи ребенка. Проводили расшифровку текстов. Фонетическое описание речевого материала осуществляли на основании символов Международного фонетического алфавита.

В целях уточнения представлений о разных способах обработки информации в процессе восприятия проводили дихотическое тестирование и регистрацию ЭЭГ. Вычисляли коэффициент латерального предпочтения (КЛП). ФСМА определяли по тестам, выявляющим использование ведущей руки, ноги, глаза и уха. Использовался стандартный набор заданий. Для всех детей считали коэффициент асимметрии для каждого задания и общий коэффициент. Анализ ЭЭГ проводили на основе пакета программ «ЭЭГ-2000» (версия 3.0). Оценивали характеристики альфа-ритма по степени выраженности; асимметрии; локализации.

Информированное согласие на проведение исследования утверждено Этическим комитетом СПбГУ.

Статистическую обработку данных проводили в программе «Statistica 8» с использованием методов Манна–Уитни, Вилкоксона, критерия Фишера, корреляционного и факторного анализа.

В ходе проведенного исследования показано, что речевое развитие детей 4–7 лет характеризуется лексиконом, содержащим слова из одного–пяти слогов (при преобладании слов из двух слогов), и увеличением слов с большим числом слогов к 7-летнему возрасту; с возрастом детей – уменьшением ошибок, связанных с произнесением слов, и увеличением ошибок во фразах; увеличением количества реплик в диалогах с взрослым и их усложнением за счет использования реплик из нескольких фраз и сложных фраз, содержащих большее число частей речи, в зависимости от темы диалога.

На основе проанализированной выборки показано, что дети в 4.5 года узнают и читают буквы; в 5–6 лет – буквы, слоги, слова и фразы, в 6.5 года – слоги, слова и фразы, в 7 лет – слова и фразы. Показано, что дети 5 лет, читающие буквы и не умеющие читать, имеют более разнообразный лексикон по количеству слов с разным числом слогов по сравнению с детьми, читающими слова и фразы. Лексикон детей, читающих буквы, слоги, слова и фразы, не различается в 6 и 7 лет.

У детей 5–7 лет при чтении длительность ударных гласных в словах выше, чем в словах спонтанной речи; площадь формантных треугольников для ударных гласных при чтении больше, чем в спонтанной речи. Для детей, читающих фразами, различия между значениями временных и спектральных характеристик гласных в чтении и речи отсутствуют.

Выявлена связь между сформированностью навыка чтения у ребенка и пониманием им прочитанного материала и взаимосвязь показателей, отражающих высокий уровень речевого развития детей с преимущественно правосторонней функциональной сенсомоторной асимметрией.

ЭЭГ детей, находящихся на начальном уровне овладения навыком чтения, характеризуется нерегулярным, неустойчивым, низкочастотным и низкоамплитудным альфа-ритмом с нестабильной центрально-теменно-затылочной асимметрией. Для детей, читающих по слогам, альфа-ритм высокоамплитудный, выраженный, с тенденцией к левостороннему доминированию.

У детей, читающих слова и фразы, альфа-ритм средне- и низкоамплитудный, преимущественно регулярный, с преобладанием левостороннего доминирования в теменно-затылочных областях.

Проведенное исследование позволяет сделать заключение о существовании прямой связи между возрастом ребенка, сформированностью у него навыка чтения, уровнем речевого развития, функциональной сенсомоторной асимметрией и характеристиками и локализацией альфа-ритма в ЭЭГ-картине.

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СЕМАНТИКА НЕПЕРВООБРАЗНОГО ПРОСТРАНСТВЕННОГО ПРЕДЛОГА: ТОПОЛОГИЯ И ФУНКЦИОНАЛЬНЫЕ ОСТРОВА

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Русский предлог *поверх* относится к непервообразным предлогам — классу, включающему также такие предлоги, как *среди*, *против*, *около*, *вместо*, *вокруг*, *сквозь*, *благодаря*, *согласно* и др. Многие непервообразные предлоги одноименны наречиям и деепричастиям (ср. *вокруг стола — огляделся вокруг, благодаря подсказке — мысленно благодаря слушателей*) или производны от имен существительных. В целом же они менее частотны, имеют достаточно узкую сферу употребления и во многом дублируют отдельные функции первообразных предлогов, таких, как *на*, *над*, *по* и др. Традиционно считается, что непервообразные обладают простым значением, в отличие от многозначных первообразных предлогов.

На примере предлога *поверх* мы хотим показать, что непервообразные предлоги кодируют всё же достаточно представительный набор пространственных отношений, если формулировать их в терминах топологических признаков пространственных объектов [Talmy 1988, Рахилина 2000] и образных схем [Johnson 1987], ср. *уложить зеленый перец поверх красного* (слой вещества, контактно расположенный на слое другого вещества), *в халате поверх пальто* (оболочка, находящаяся вокруг другого объемного объекта/оболочки), *смотреть поверх очков* (луч, проходящий выше вертикальной преграды).

С точки зрения Грамматики Конструкций [Fillmore 1988, Fillmore et al. 1988, Kay, Fillmore 1999, Goldberg 1995, 2006] здесь может идти речь о единой предложной конструкции, которая активно взаимодействует с другими, обычно глагольными, конструкциями. В зависимости от типа предиката, выражающего динамическую или статическую ситуацию, группа с предлогом *поверх* становится либо сирконстантом образа действия, либо актантом, обозначающим место, траекторию или конечную точку, ср. *смотреть поверх забора; лечь на кровать поверх одеяла; сидеть поверх мешков; стрелять поверх толпы; бросить платье поверх чемодана*. В результате взаимодействия предложной и «второй» конструкций получается множество конкретных пространственных интерпретаций (ср. здесь фреймы Ч. Филлмора [1982] как единицы более мелкие, чем конструкции). Тем не менее, все интерпретации связаны между собой, образуя радиальную категорию семантики конструкции [Lakoff 1987].

Эта категория имеет не один, а два мощных функциональных центра, «положить (слой) выше» и «смотреть выше (преграды)». В первом случае в фокусе внимания находятся фигура и фон, которые располагаются контактно как два слоя (пластины). И при горизонтальной, и при вертикальной ориентации фигура расположена ближе к глазу наблюдателя, закрывая собою фон. Во втором случае роль фигуры переходит к траектории, исходящей от активного участника ситуации: взгляд агенса проходит выше преграды и, в прототипическом случае, перпендикулярно

ей, наблюдатель же, как правило, локализуется там же, где агенс.

Функциональные ситуации приготовления еды (слой за слоем), изготовления предметов (из нескольких слоев материалов), расположения книг и листов на письменном столе характерны для центрального класса «положить (слой) выше». Ситуация надевания одежды (один слой поверх другого) образует следующий крупный функциональный остров, где меняются геометрические характеристики фона и фигуры. Соответствующей реинтерпретации требует и другая функциональная ситуация, «человек лежит на постели поверх одеяла». Второй центр категории, прежде всего, связан с функцией «смотреть». Близкими типами, действующими траекторию, являются ситуации распространения звука, запаха, дыма, а кроме того, стрельбы.

Функциональные острова преопределяют и дальнейшее расширение пространственной семантики. Например, метонимия «траектория – конечная точка» в ситуации визуального восприятия позволяет перейти от случая *смотреть поверх забора к колокольня видна/ торчит поверх забора* и к *орден поверх медалей*. В ситуации «человек лежит на постели поверх одеяла» задействуется дополнительная точка отсчета – основная несущая поверхность (кровать), на которой лежит одеяло как промежуточный слой. Функция «прокладки» прослеживается и в других классах, ср. *бинтовать поверх старых бинтов* или *обить дверь клеенкой поверх войлока*. Некоторые функциональные типы (текст, рисунок) могут допускать двоякую пространственную интерпретацию, одна из которых связана с нанесением дополнительного слоя краски, а другая – с тем, что предметы видятся вертикально друг над другом, ср. *рисунок поверх иконы, надпись поверх деревьев, штамп поверх текста*.

Многие функциональные острова чрезвычайно частотны (по корпусным данным), и это указывает не только на то, что некоторые шаблоны активно эксплуатируются в художественной литературе и публицистике, но и на то, что такие ситуации культурно специфичны и обогащают конструкцию новыми семиотическими смыслами. Так, контексты *носить кресты поверх рубаш, рубаша, выпущенная поверх штанов, брюки поверх сапог, спать поверх одеяла* говорят много о культуре поведения; если человек смотрит *поверх очков* или *поверх собеседника*, это сообщает наблюдателю нечто о его отношении к визави; *выстрел поверх толпы* служит для того, чтобы напугать или разогнать людей. Неудивительно, что и разные топологические типы объектов

будут в разной степени активны в тех или иных функционально нагруженных ситуациях: для ситуации «смотреть» релевантна преграда, находящаяся близко к агенсу, в частности, ею могут служить очки, предмет перед глазами или собеседник. Наоборот, во фрейме звука больше задействованы объекты, мыслимые как трехмерный объект с верхней поверхностью (ср. *крик плыл поверх толпы*).

Важно, что, несмотря на два центра категории, все пространственные интерпретации связаны в общую сеть. Важным связующим классом здесь является пространственная ситуация нахождения фигуры выше фона (обычно относительно какой-то поверхности, ср. *орден поверх медалей*). Она, с одной стороны, связана с «визуальным» центром категории, а с другой стороны, с центром «расположения слоев один поверх другого». Ситуация *сидеть поверх обозы* отсылает к схеме «фигура видна выше фона», но также связана со схемой «пластина поверх горы» (ср. *накинуть брезент поверх мешков*).

Конструкция с непервообразным предлогом не может быть простым «дублиром» других предложных конструкций. Как показывают примеры, конструкция втягивает в свой обиход фреймы конструкций с предлогами *на, над, по, через, вдоль*, однако не дублирует их полностью, а, так сказать, «идет поперек». Особенностью конструкции с *поверх* является ее динамичность: один слой выкладывают, надевают, накидывают, натягивают поверх другого, так же динамично выстраивается траектория взгляда, выстрела, звука или полета (ср. здесь также внутреннюю форму предлога *по+верх*, где аккузатив указывает на направление движения, а не на статическое положение). Во многом динамический аспект позволяет объяснить сложные сочетания топологических типов, неочевидные для семантики конструкции.

Итак, при известном разнообразии пространственной семантики, наблюдаемом в тех или иных классах употреблений, конструкция с предлогом *поверх* представляется единым целым. Не все переходы между употреблением объясняются стандартными топологическими трансформациями («вертикальное расположение – горизонтальное расположение», «пластина – гора»), однако, как мы видели, некоторые топологические ограничения могут ослабляться, и прежде всего в функционально нагруженных фреймах. Небольшая часть употреблений вообще подчеркнута идиоматична (ср. *государство меня поверх земли не бросит, плывет... монисто поверх воды*), то есть интерпретация происходящего не выводится полностью из семантики

предлога, глагола, топологических классов имен и функциональных отношений. Однако даже такие культурно укорененные контексты

встраиваются в радиальную схему предлога и могут быть интерпретированы с помощью более тонких механизмов семантической мотивации.

МЕЖДИСЦИПЛИНАРНЫЕ ИССЛЕДОВАНИЯ, ПРЕДМЕТ ПСИХОЛОГИИ И СОИЗМЕРИМОСТЬ ТЕОРИЙ В ПСИХОЛОГИИ

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Обсуждается одна из важнейших фундаментальных научных проблем – исследование методологических оснований и разработка на этой методологической основе теории комплексных психологических исследований. Известно, что в настоящее время организация комплексных психологических исследований сталкивается со значительными трудностями, вследствие чего комплексные исследования и разработки оказываются существенно менее эффективными, чем предполагалось.

Подчеркнем фундаментальный характер данной проблемы, от ее решения зависит эффективность осуществления как комплексных исследований в рамках психологии (взаимодействие между отраслями психологической науки), так и организация междисциплинарных исследований (взаимодействие психологии с другими науками). Хотя данной проблематике уделяется значительное внимание исследователей, проблема на настоящий момент не решена. Причина этого состоит в том, что исследователи (как отечественные, так и зарубежные) в основном стремятся разработать правила, принципы и стратегии организации такого рода исследований. Эффективность комплексного исследования в психологии в значительной мере обусловлена степенью концептуального совпадения понимания и трактовки предмета психологии в научно-исследовательских подходах в тех предметных областях, которые будут взаимодействовать (соотноситься) в данном комплексном исследовании. Заметим, что это фактически не учитывается в существующих в настоящее время концепциях комплексных исследований в психологии. Следовательно, методологические основания (и основанная на них теория) должны раскрывать способ трактовки предмета, представленный в научных подходах, реализующихся в комплексном исследовании. Новизна настоящего подхода состоит в том,

что в нем реализуется разработка методологии и теории проведения комплексных психологических исследований, исходя из понимания предмета психологической науки. Это первое методологическое основание.

В решении проблемы предмета можно выделить два аспекта, а точнее, два этапа ее решения. Первый этап – формальное описание предмета (какие функции он должен выполнять, каким критериям соответствовать). Эта работа в значительной степени уже проделана в предыдущих исследованиях автора (Мазиллов, 2006). Второй этап – содержательное наполнение концепта «предмет психологии». Представляется, что наиболее удачным является термин «внутренний мир человека». Именно он позволяет, на наш взгляд, осуществить содержательное наполнение, вставив всю психическую реальность в полный объем. Это явится важным этапом на пути становления психологии фундаментальной наукой и, с другой стороны, необходимым условием для осуществления эффективных комплексных исследований.

Вторым методологическим основанием для реализации междисциплинарного подхода является идея соизмеримости психологических концепций. Многие психологи разделяют мнение, что психологические концепции несоизмеримы. При этом обычно ссылаются на работу Томаса Куна «Структура научных революций», в которой он, как многие полагают, обосновал этот тезис (Кун, 1975). Обратим внимание, что обычно те психологи, которые восприняли куновские положения, говорят о несоизмеримости теорий вообще. Попробуем критически отнестись к распространению выводов куновской теории на психологию. Выскажем некоторые соображения, которые, на наш взгляд, вносят долю сомнения в применимости идей классика к предметной области психологии.

1. Рассуждения Т. Куна основываются на примерах и обобщениях, взятых из истории естественных наук. Никем пока не доказано, что эти рассуждения имеют столь универсальный характер, что могут адекватно представлять ситуацию в области научной психологии.

2. Обычно упускается из виду, что ключевым моментом для рассуждений Т. Куна является научная революция. Кун говорит именно о несоизмеримости предреволюционных и постреволюционных нормальных научных традиций. В психологии дело чаще всего обстоит не так, поскольку психология явно не является монопарадигмальной дисциплиной. Поэтому безоговорочный перенос куновских рассуждений на область психологии сомнителен.

3. В психологии мы действительно имеем различные теории одного явления (число их исчисляется десятками). Подчеркнем, что авторы новой теории не ставят перед собой задачи опровергнуть другие теории. Задачу они видят скорее в том, чтобы дать адекватное описание и объяснение психического феномена. В этом случае говорить о революции не приходится. Поэтому речь о переходе между конкурирующими парадигмами, естественно, не идет. Таким образом, в психологии чаще всего просто нет задачи опровержения старой точки зрения, там лишь заявляется новый подход.

4. По Куну, переход между конкурирующими парадигмами не может быть осуществлен постепенно шаг за шагом посредством логики и нейтрального опыта. В этом моменте, возможно, наблюдается радикальное расхождение между естественными науками и психологией. Дело в том, что количество «степеней свободы» при рассмотрении психических явлений значительно больше, чем в любой из естественных наук. Это совершенно естественно, если принять во внимание сложность самих объекта и предмета психологической науки. Соответственно, имеется значительно большее число возможных аспектов анализа. В этой связи важно подчеркнуть, что при формулировании теории важнейшую роль играют неосознаваемые самим исследователем процессы. Предтеория – исходные

представления ученого, она предшествует исследованию, часто вообще не осознается самим исследователем и выступает в качестве неявного основания исследования. Выявлено, что предтеория играет определяющую роль при проведении исследования в области психологии (Мазиллов, 2007).

5. Как становится понятно, противоборство между парадигмами Т. Кун рассматривает как естественный процесс развития научного знания. Если использовать введенное выше различие стихийной и целенаправленной интеграции, можно предположить, что вполне возможна ситуация, при которой работа соотнесения концепций выполняется незаинтересованным, нейтральным лицом – методологом или историком науки, т.е. становится целенаправленной. Логично предположить, что в такой работе становится возможным то, что недоступно при стихийном соотнесении. Особенно если вспомнить о том, что процедура предполагает выявление не осознаваемых самими исследователями оснований.

6. Наконец, обратим внимание на то, что Т. Кун исходит из явной аналогии между гештальтскими исследованиями восприятия и переходом от одной парадигмы к другой. Действительно, хорошо известно, к примеру, что в случае «двойных» изображений нельзя одновременно распознать оба изображения на картинке. И переход внезапный. Иными словами, Томас Кун использует эти опыты как моделирующее представление, которое оказывается неадекватным.

Таким образом, мы полагаем, что принципиальная несоизмеримость теорий и концепций в современной психологии не доказана. Идея соизмеримости реализуется нами в концепции когнитивной методологии психологии (Мазиллов, 2011).

ЯЗЫКОВЫЕ СВОЙСТВА ЛОКАТИВНЫХ ПОКАЗАТЕЛЕЙ С ТОЧКИ ЗРЕНИЯ ИХ КОГНИТИВНОЙ СЛОЖНОСТИ

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Пространственная информация носит визуальный характер, однако язык кодирует информацию линейно и последовательно. Таким образом, все параметры ситуации воспринимаются одновременно, а передать их надо последовательно с помощью дискретных единиц.

Характер человеческой коммуникации требует, чтобы язык выражал информацию точно и при этом достаточно быстро. Следовательно, язык должен иметь такое количество специфических пространственных терминов, которое соответствовало бы глубине и объему человеческой памяти, и при этом необходимы достаточно общие термины, покрывающие все поле возможностей. Язык не может обойтись без специфических терминов и использовать только общие. Как

утверждается в работе Talmy 1983, специфические термины должны быть равномерно распределены по семантическому пространству. Несомненно, есть факторы, такие, как высокая употребительность или культурная значимость некоторых понятий, способствующие появлению в разных языках похожих локативных показателей. Тем не менее, наблюдается множество несоответствий между специфическими пространственными морфемами разных языков: даже самые базисные, общие абсолютно для всех людей независимо от культуры и среды обитания свойство нашего мира, такие, как гравитация и строение человеческого тела, могут отражаться в языках целым спектром средств и способов. Разнообразие значительно усиливается, если сравнивать неродственные языки и непохожие культуры.

На ширококом типологическом материале в настоящем докладе будут проиллюстрированы следующие положения:

Общие пространственные понятия: 1. Присутствуют в грамматике любого языка, имеют высокую частотность употребления; 2. Выражаются наиболее грамматикализированным из имеющихся в данном языке способов; 3. Составляют ядро функционально-семантического поля локативности, т.е. являются прототипическими пространственными показателями; 4. Типологически представляют собой достаточно устойчивый набор значений ('нахождение в некотором месте', 'нахождение на поверхности ориентира', 'нахождение внутри ориентира'); 5. Рано начинают употребляться детьми при усвоении родного языка.

Специфические пространственные понятия: 1. Набор и количество показателей специфических пространственных понятий сильно отличаются в разных языках; 2. Показатели, выражающие специфические пространственные концепты, имеют большую морфологическую сложность, чем показатели с общим значением, характеризуются дополнительными морфосинтаксическими свойствами или выражаются средствами, близкими к лексическим; 3. Являются периферийными членами функционально-семантического поля локативности; 4. Имеют широкое типологическое варьирование как в плане выражения, так и в плане содержания; 5. Позже появляются в речи детей при усвоении родного языка, вызывают большее число ошибок.

Пространственная ориентация строится относительно обычного расположения частей человеческого тела. Три измерения пространства — длина, ширина, высота — накладываются на три

измерения человеческого тела — перед/зад, лево/право, верх/низ. Чрезвычайно важно отметить, что это не одно и то же, хотя эти измерения совпадают при прототипическом вертикальном расположении человека. Действительность устроена так, что для человека эти измерения не являются равноправными.

Так, с точки зрения восприятия, пространство перед человеком и над землей оптимально для восприятия, поэтому направления вверх и вперед являются позитивными, в противоположность направлениям вниз и назад (Clark&Clark 1977). Верхняя и передняя часть объекта, как правило, видимы, в то время как нижняя и задняя часть или пространство под поверхностью скрыты от глаз наблюдателя.

С функциональной точки зрения в повседневном опыте важна верхняя поверхность и внутренняя окрестность объектов, поскольку из-за гравитации каждый предмет должен опираться на другие объекты, вмещать другие объекты или быть к ним прикреплен. Нижняя же поверхность редко несет на себе функциональную нагрузку. Очень важными пространственными понятиями, которые усваиваются детьми одними из первых, являются типичная ориентация, близость и контакт между объектами (Clark&Clark 1977, Гвоздев 1961, Johnston 1988, Leikin 1998). У большинства людей ведущей, т.е. функциональной, является правая рука, поэтому во многих языках пространственный термин со значением «право, правый», означает также «правильный», «хороший»; термин же со значением «лево» обычно имеет отрицательные коннотации. Понятие «хороших» и «плохих» с точки зрения восприятия и функциональности измерений метафорически переносится и на другие сферы жизни человека: эмоциональную, ментальную, социальную, культурную, мифологическую и пр.

На появление специфических концептов в пространственной системе языка могут также оказывать влияние социальные и культурные факторы. Так, например, в языках аборигенов Австралии встречаются очень развитые системы ориентации по сторонам света, которые используются вместо относительной ориентации, выражаемой предлогами в европейских языках. В некоторых сообществах эта система совмещается с ориентацией, отражающей локальный уклон местности ('вверх по склону' и «вниз по склону»), а для живущих вблизи рек характерно использование ориентации «вверх по реке» и «вниз по реке» (Levinson 1992). Большая часть утверждений об универсальности тех или иных пространственных концептов делалась на

основании материала индоевропейских языков, однако с новыми данными из австралийских, австронезийских, папуасских и америндских языков следует пересмотреть наши понятия об универсалиях по отношению к пространству и пространственной ориентации, как показано в типологических исследованиях Senft 1997, Bennardo 2002, Mithun 1999 и др.

Итак, базовые с когнитивной точки зрения локативные понятия относятся к грамматическому ядру языка, однако с нарастанием когнитивной сложности усиливается вариативность в количестве показателей и способе выражения понятий.

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МИКРОСТРУКТУРНЫЙ АНАЛИЗ ЗАПОМИНАНИЯ НЕЗНАКОМЫХ СЛОВ НА ИНОСТРАННОМ ЯЗЫКЕ

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В психологии неоднократно осуществлялись попытки соотнести микроструктуру когнитивных действий с параметрами движений глаз (Величковский, 2006). Многочисленные исследования движений глаз в процессе чтения привели к появлению большого количества объясняющих моделей, часть из которых ставит во главу угла аспекты семантической обработки и понимания текста, другая — физические параметры организации стимулов (Rayner, 1998; Clifton et al., 2006). В данном исследовании мы использовали естественную ситуацию обучения иностранному языку для того, чтобы проанализировать влияние особенностей начертания слова и его смыслового наполнения на характер движений глаз и эффективность когнитивной обработки.

Методика

Испытуемые. В эксперименте принял участие 21 испытуемый, студенты Московского государственного лингвистического университета с нормальным зрением.

Аппаратура. Использовался компьютер, оснащенный установкой для бесконтактной регистрации движений глаз фирмы SMI системы

RED-X (система основана на «методе темного зрачка» — источник подсветки сдвинут относительно оптической оси камеры).

Стимульный материал. Испытуемым на мониторе предъявлялись слайды, имитирующие страницу учебного пособия и содержащие по одному слову английского языка с русским переводом. Были подобраны редко используемые в лексиконе русскоязычных студентов слова английского языка биологической тематики. Все слова состояли из 7 букв. Перед началом основной части исследования проверялось знание испытуемыми стимульных слов. Для снижения влияния «позиционного эффекта» на итоговый результат использовалась дополнительная группа слов, которые предъявлялись в начале и в конце списка и не учитывались при обработке.

Форма предъявления слов. Английские слова предъявлялись разными типами шрифта: стандартным шрифтом Arial, шрифтом с разреженным межбуквенным интервалом, шрифтом с чередованием строчных и прописных букв и жирным шрифтом.

Процедура исследования. Испытуемому сообщалось, что эксперимент проводится в целях изучения процесса запоминания, от них требовалось запомнить как можно большее слов иностранного (английского) языка. До начала основной серии проверялось, насколько испытуемые знакомы со словами, используемыми в эксперименте. Испытуемые заполняли бланки,

в которых были даны русские слова, которые необходимо было перевести на английский. В основной части использовались только совершенно незнакомые слова. После этого осуществлялась процедура калибровки аппаратуры для регистрации движений глаз. Далее испытуемому предъявлялись 16 матриц, которые моделировали страницы учебника иностранного языка, страница начиналась и заканчивалась псевдотекстом, в центре страницы было размещено слово с его переводом. Время предъявления каждого слайда составляло 7 секунд. Движения глаз регистрировались с того момента, как взор испытуемого попадал на английское слово. Затем испытуемым снова предъявлялись бланки, в которых русскому слову требовалось дать английский эквивалент.

Обработка данных проводилась с использованием статистического пакета SPSS-17.

Результаты и обсуждение

Были подсчитаны количество и среднее время фиксации для английских и русских слов, а также количество возвратных саккад. Кроме этого, анализировалась эффективность запоминания слов как показатель успешности когнитивной обработки.

Среднее время фиксации для задачи запоминания незнакомых иностранных слов составило 394,7 мс. (Это довольно высокий показатель: для чтения «про себя» текста на родном языке он составляет 225 мс, а для чтения вслух – 275 мс (по данным Rayner, 1998). Среднее количество фиксации составило 14,62.

Общее количество и среднее время фиксации зависело от формы предъявления слов. Дисперсионный анализ (ANOVA) позволил выявить высокосignимые различия в количестве фиксации в зависимости от характера шрифта ($F(3, 301) = 3,796$, $p = 0,012$. При этом источник различий был связан с разряженным шрифтом, количество фиксации для которого (15,92) было значимо выше, чем для всех остальных вариантов шрифта. Наименьшее количество фиксации приходилось на жирный шрифт (13,58). Среднее время фиксации также значимо (хотя и не столь явно) различалось в зависимости от типа шрифта. Наименьшее время фиксации было связано с разряженным шрифтом (346,6), наибольшее – с наиболее привычным начертанием слов (438,1). Время фиксации характеризует глубину когнитивной обработки.

Однако характеристики шрифта значимо не влияли на эффективность запоминания слов. Хотя в качестве тенденций можно отметить, что незнакомые иностранные слова лучше всего запоминались, когда они предъявлялись обычным, неакцентуированным вариантом шрифта, и хуже всего запоминались при предъявлении разряженным шрифтом. Из этого можно заключить, что растрачивание ресурсов на побуквенное восприятие слов, которое ведет к возрастанию числа фиксации и уменьшению времени фиксации, снижает эффективность когнитивной обработки.

Хотя было продемонстрировано, что число и время фиксации на словах родного языка было значимо меньше, чем на словах иностранного языка, обнаружилось, что эти показатели существенно образом влияют на запоминание иностранных слов. Группы испытуемых, выявленные с помощью кластерного анализа на основе количества фиксации на русском переводе и количества возвратных саккад, значимо различались по количеству воспроизводимых иностранных слов ($F(1, 101) = 4,05$, $p = 0,047$).

Заключение

В результате проведенного исследования были выявлены эффекты влияния формы предъявления слов на стратегии движения глаз, однако они оказывали слабое влияние на эффективность запоминания. Запоминание иностранных слов в гораздо большей степени было связано с установлением более прочной ассоциативной связи между внешней формой слова и его значением, заданного на русском языке. Это выражалось в увеличении времени фиксации на русском слове и увеличении количества возвратных саккад. В целом данные подтверждают теории, представляющие движения глаз при чтении как стратегии когнитивной обработки, изменяющиеся в зависимости от условий предъявления материала и целевых установок.

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ЭЭГ-фМРТ ИССЛЕДОВАНИЕ СОХРАННОСТИ МЕХАНИЗМОВ ПЕРВИЧНОГО РАСПОЗНАВАНИЯ ЗВУКОВ РЕЧИ/ФОНЕМ У ПАЦИЕНТОВ ПОСЛЕ ИНСУЛЬТА С СЕНСОРНЫМ КОМПОНЕНТОМ НАРУШЕНИЯ РЕЧИ

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Определение уровня нарушения речевой функции с помощью совмещения неинвазивных методик нейровизуализации представляется перспективным как для прогноза восстановления и оптимизации реабилитационного процесса, так и в плане исследования механизмов речи в норме и при патологии.

Целью данного пилотного исследования было проверить гипотезу нарушения первичного этапа восприятия речи у людей с сенсорной афазией. Для этого была использована пассивная odd ball парадигма с предъявлением слогов «ба» в качестве стандартных стимулов и «па» в качестве девиантных, направленная на выделение компонента негативности рассогласования (НР). А также аналогичная контрольная парадигма с использованием тоновых щелчков. Обе парадигмы были адаптированы для одновременной регистрации фМРТ и ЭЭГ. В исследовании участвовали 25 испытуемых: 15 здоровых добровольцев и 10 пациентов с наличием

сенсорной афазии на фоне общего снижения речевой функции после инсульта в левом полушарии мозга.

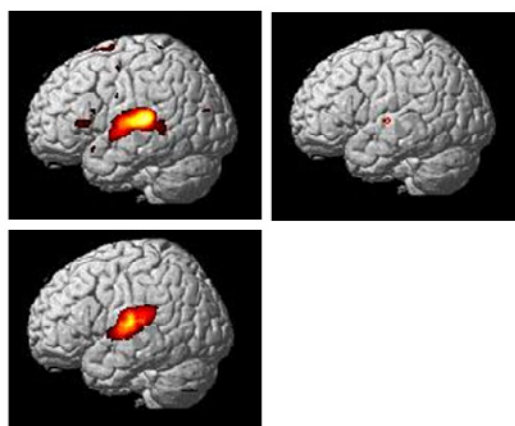
В результате фМРТ-ЭЭГ эксперимента в обеих группах были выявлены следующие двухсторонние зоны активации коры: извилина Гешля, задняя, средняя и нижняя части верхней височной извилины (ВВИ), угловая извилина, рис.1.

Кроме того, визуализация методом фМРТ предположительно продемонстрировала сохранность/компенсацию механизма НР на новые стимулы у пациентов с левосторонним структурным поражением и наличием сенсорной афазии средней степени тяжести. Что также подтвердили данные записи ЭЭГ (корковых ВП), одновременной с фМРТ сканированием.

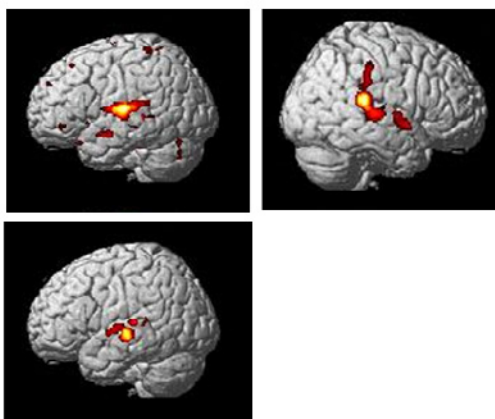
НР является индикатором способности различать слуховые и зрительные стимулы [1].

Когнитивный и сенсорный компоненты НР локализованы в передней и задней частях слуховой коры, соответственно, что было показано как для речевых фонем, так и для тоновых стимулов. В опытах с активной постановкой задачи было показано, что пассивное (сенсорное) различение больше связано с задней частью ВВИ [2], что соответствует полученным данным как у пациентов с афазией, так и испытуемых контрольной группы.

контрольная группа



афазия средней степени тяжести (с сенсорным компонентом)



Height threshold $T=3.272912$ $p<0.001$ (unc.) spm8

Рис.1 Пример сопоставления областей активации у здоровых испытуемых и пациентов с постинсультной афазией.

В нашем исследовании выявление областей активации, сопоставимых с данными предыдущих исследований, а также с данными контрольной группы, у пациентов с постинсультной афазией может служить прогностически благоприятным критерием.

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ОБЩНОСТЬ ПСИХОЛОГИЧЕСКИХ СТРУКТУР И МЕЖИНДИВИДУАЛЬНЫЕ ОТНОШЕНИЯ В ДИАДЕ

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Ранее нами была обоснована гипотеза о существовании надиндивидуальных психологических структур, лежащих в основе как межиндивидуальных отношений, так и взаимодействий индивидов с предметной областью (Максимова, Александров и др., 2004; Максимова, Александров, 2009). С этой точки зрения принципиальное ограничение изучения межиндивидуальных отношений состоит в том, что существующие методики специально разработаны для оценки психологических характеристик именно индивида, в то время как исследование должно быть направлено на измерение свойств группы взаимодействующих индивидов как целостного образования. Цель исследования состояла в том, чтобы (1) на основе индивидуально-психологических характеристик разработать интегральную оценку межиндивидуальных отношений и (2) установить сопряженность степени сходства психологических структур индивидов, сформированных в процессе взаимодействия, с такой интегральной оценкой.

Методика. В работе принимали участие две группы испытуемых, всего 152 человека (100 женщин и 52 мужчины, в возрасте от 16 до 28 лет). (Опыты проведены Н. А. Живовой, М. В. Коломеец и А. А. Сергеевцевой). Все испытуемые формировали компетенцию в стратегической игре двух партнеров (крестики и нолики на поле 15×15). Диады для игры формировали из незнакомых друг с другом лиц. Для оценки индивидуально-психологических характеристик членов диады использовали: (1) методику

ДМО (диагностика межличностных отношений) Л. Н. Собчик, (2) МИГИ (методика измерения гендерной идентичности) М. В. Бурлаковой и Л. А. Лабунской, (3) методику диагностики предрасположенности личности к конфликтному поведению К. Томаса, (4) методику диагностики направленности личности Б. Басса, (5) Big Five П. Т. Коста и Р. Р. МакКре. Все методики, исключая «Big Five», использовали в стандартном и в модифицированном варианте, когда каждый участник после сеанса стратегической игры оценивал своего оппонента.

На основе протоколов игры для каждого испытуемого реконструировали и формально описывали структуру знания (СЗ) в стратегической игре по специальным алгоритмам в терминах компонентов, отношений между ними, стратегий двух типов, доменов и их организации. Размерность матрицы, содержащей описания СЗ для 176 игроков (32 переменные), снижали с помощью факторизации с последующим вращением PROMAX (4). Для полученных факторных оценок с помощью многомерного шкалирования строили пространство, в котором возможно определение расстояний между точками/объектами. Сходство СЗ участников оценивали, как расстояние между точками, представляющими эти структуры в построенном пространстве.

В качестве интегральной оценки межиндивидуальных отношений для диады игроков по каждой шкале всех методик использовали величины оценок у игрока, показавшего максимальное значение (МЗ) анализируемого признака. Рассчитывали также различие для выраженности каждого признака между членами диады (РЗ). Эти величины, как и оценка сходства СЗ,

Группы	ДМО		МИГИ		Методика Томаса		Методика Басса		Big Five	
	станд	мод	станд	мод	станд	мод	станд	мод	станд	мод
Группа I, 49 диад	+		+	+					+	
Группа II, 27 диад	+	+			+	+	+	+		

Таблица 1. Группы испытуемых и использованные методики

обладают математическими свойствами расстояния (симметрией, транзитивностью и рефлексивностью), описывают свойства диады как целостного образования, а не каждого из ее членов отдельно. Для установления сопряженности степени сходства СЗ и интегральной оценки межиндивидуальных отношений применяли процедуры линейной и логистической регрессии с прямым и обратным порядком отбора переменных. Оценивали качество моделей (критерии χ^2 , R^2_{adj} , результаты ANOVA), а также наборы переменных, включенных в модели.

Результаты и их обсуждение. Модели высокого уровня достоверности получены для наборов переменных, включающих МЗ и РЗ для стандартных и модифицированных вариантов психологических методик. Для I группы диад (набор переменных см. в Табл. 1): линейная регрессионная модель – $R^2_{adj} = 0.41$, ANOVA – $F = 4.43$, $df = 10$, $p = 0.0004$; логистическая регрессия – $Cox \& Snell R^2_{adj} = 0.41$, $\chi^2 = 27.56$, $df = 10$, $p = 1.5 \cdot 10^{-5}$, 85.7% правильных идентификаций. Модели включали переменные по методикам ДМО, Big Five, МИГИ. Для II группы диад: линейная регрессионная модель – $R^2_{adj} = 0.91$, ANOVA – $F = 24.65$, $df = 11$, $p = 2.9 \cdot 10^{-7}$; логистическая регрессия – $Cox \& Snell R^2_{adj} = 0.59$, $\chi^2 = 23.01$, $df = 3$, $p = 3.8 \cdot 10^{-7}$, 92,3% правильных идентификаций. Модели включали переменные по методике К. Томаса. Использование наборов переменных, в которых отсутствовали либо стандартные, либо модифицированные оценки, содержащие либо только МЗ, либо только РЗ, приводило или к незначимым моделям, или к снижению уровня их значимости до критической величины 5%. Использование для моделирования оригинальных значений переменных, а не рассчитанных на их основе МЗ и РЗ, для I группы диад вело к незначимым линейным и логистическим регрессионным моделям, а для

II группы – к радикальному снижению уровней значимости.

Таким образом, степень сходства СЗ, которые формируются в совместной деятельности членов диады, достоверно соответствует не «исходным» для актуального взаимодействия индивидуально-психологическим свойствам каждого из индивидов, а их соотношению, оцениваемому по максимальной выраженности характеристики у одного из членов диады и различия в выраженности этой характеристики для пары. Важнейшая составляющая интегральной оценки межиндивидуальных отношений, без которой не удастся достичь достоверного уровня сопряженности психологических характеристик членов диады и сходства организации их СЗ, – **ретроспективные оценки психологических свойств партнера по деятельности** (для этого применена модификация методик). В этих оценках фиксированы результаты межиндивидуальных взаимодействий, в процессе которых формировались СЗ, носители которых – члены диады. Можно предполагать, что эти СЗ представляют собой индивидуализированные составляющие надиндивидуальной, общей для диады психологической структуры, обеспечивающей прогноз действий оппонента, взаимопонимание партнеров и саму возможность совместных действий.

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КЛЕТОЧНЫЕ ОСНОВЫ КОГНИТИВНОСТИ

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Анализ принципов и механизмов функционирования когнитивных систем представляет как теоретический, так и практический интерес. Предпринимаемые попытки создания

таких систем осложняются недостаточным пониманием принципов функционирования их прототипов. Исследование работы таких прототипов – биологических когнитивных систем осложнено не столько недостатком данных об этих системах, сколько отсутствием концептуальных моделей, объединяющих эти данные в систему знаний.

Когнитивные реакции, на организменном уровне состоящие в способности к восприятию, переработке информации, обучению,

предсказанию и управлению, базируются на функциональных реакциях отдельных нервных клеток. Выявление основных информационных свойств нервных клеток и простых нейронных ассоциаций как молекулярных информационных систем, структурно-функциональной организации и механизмов работы таких систем является наиболее актуальной задачей.

В последнее десятилетие происходит стремительное расширение фронта нейробиологических исследований, сопровождающееся накоплением огромных объемов экспериментальных данных по структуре, функции и эволюции мозга и нервной системы на различных уровнях их иерархической организации. Открыты многие молекулярные компоненты, включенные во внутриклеточные пути передачи информации от рецепторных к эффекторным структурам нейрона. Методами молекулярной биологии удалось установить химическое строение многих белков, вовлеченных в процессы межклеточной и внутриклеточной сигнализации. Установлены генетические особенности нейронов и разработаны генносетевые методики (Терентьев 2009). Разработка методов регистрации токов одиночных ионных каналов наряду с другими методами позволила расшифровать структурно-функциональную организацию этих молекулярных ансамблей. Совершенствование методов микроскопии, использование лазерных технологий и методов извлечения сигнала из шума позволило исследовать микроструктурные основы функционирования живых нервных клеток и их органелл. Была показана чрезвычайно сложная молекулярная организация нейрона. В состав одного из элементов клетки – синапса входит более 2000 различных белков (Pastalkova et al. 2006). Определены скорости формирования этих главных структурно-функциональных элементов нейронных систем. С помощью динамического имиджинга, функциональной морфометрии, позволяющих регистрировать перегруппировку отдельных молекул, показано, что эти процессы могут осуществляться в течение нескольких десятков секунд.

Удалось приблизиться и к пониманию основных механизмов обучения и памяти. Показано, что для формирования устойчивого изменения эффективности межклеточной передачи необходимы структурные изменения в синапсе – элементарной структуре, ответственной за взаимодействие между нейронами и управляемыми ими клетками (Han et al. 2004). Эти и другие данные привели к тому, что представление о нейроне как о простом передатчике сигналов не стало казаться убедительным. Сформировался

взгляд на нейроны как на сложные молекулярные информационные машины, обладающие свойствами обучения и памяти.

Однако при несомненных успехах нейробиологии осталось неясным, на каком уровне организации возникает главное свойство нейронных систем – когнитивность. Осознание этой проблемы привело к тому, что магистральным направлением работ по анализу работы мозга стал междисциплинарный интеграционный подход, нашедший отражение в термине нейронаука (neuroscience), объединяющий методические возможности таких научных дисциплин, как неврология, нейроанатомия, нейрофизиология, молекулярная биология и генетика, химия, физика, математика, информатика, психология, психофизиология, лингвистика и многих других.

При этом, кроме сложностей, связанных с необходимостью объединения методик и терминологий, возникает один из главных вопросов, связанных с необходимостью определения и сравнения уровней когнитивности – как биологических систем, так и биотехнических комплексов, которые предполагается формировать на основе знаний о работе их биологических прототипов. Представляется необходимым ввести некоторую меру когнитивности. Когнитивность нейронных систем и мозга в целом, вероятно, можно оценивать количеством актуальных ассоциативных межнейронных связей.

Изучение клетки с точки зрения системной биологии предполагает наличие у клеточных составляющих приобретенных, так называемых производных (эмерджентных), свойств или функций. Это означает, что те или иные функции становятся возможными только при достижении определенного уровня сложности организации системы. При этом каждая из составляющих в отдельности может не обладать свойствами (и функциями), которые приобретает система из двух составляющих. А система из двух составляющих может не обладать свойствами и функциями более сложно устроенных систем. Такая интеграция предполагает рассмотрение клетки в широком диапазоне временных и пространственных масштабов. А это требует знаний о детальных качественных и количественных параметрах изменений на всех уровнях, включая межмолекулярные взаимодействия, что, в свою очередь, дает представление о целостных процессах, протекающих на уровне всей клетки.

Теоретико-экспериментальному анализу когнитивных свойств нервных клеток, основанному на интеграции структурно функциональных свойств молекулярных систем, формирующих

клеточный организм, посвящена данная работа. Показано, что нейроны *in vitro* способны к осуществлению достаточно сложных реакций, запоминанию, распознаванию образа внешнего сигнала, предсказанию возможных изменений внешних условий и предотвращению их последствий соответствующей реакцией. Известно, что для изменения поведения в некоторых структурах мозга достаточно изменения активности единичных нейронов или небольшой их популяции (Houweling 2010). Для интеграции имеющихся данных о нейронной активности ведется построение интерактома клетки.

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КОНЦЕПТУАЛЬНЫЕ СТРУКТУРЫ В СОЗНАНИИ НОСИТЕЛЕЙ ЯЗЫКА СКВОЗЬ ПРИЗМУ АССОЦИАТИВНОГО ЭКСПЕРИМЕНТА

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Лингвистические штудии когнитивного направления, целью которых является поиск когнитивного аналога для каждой языковой единицы, ставят исследователя перед задачей выбора методов исследования, позволяющих получать психологически достоверные результаты. Еще недавно Дж. Ньюмен (Newman 1996: XI) отмечал, что у когнитивной лингвистики нет своей методологии. Большинство выводов в исследованиях когнитивного направления до сих пор базируется на лингвистической интроспекции ученого. В связи с этим Л. Талми указывал, что результаты, полученные методом интроспекции, должны коррелировать с результатами, полученными с помощью других методов, в частности, с применением психолингвистического эксперимента (Talmy 2003: 5).

В последние годы в когнитивной лингвистике наблюдаются две противоположные тенденции: с одной стороны, значительная часть исследователей рассматривает интроспекцию как наилучший или даже единственно приемлемый метод исследования значения, а с другой – существует маргинальная, однако все более возрастающая тенденция привлечения эмпирических методов, используемых в других когнитивных науках (Geeraerts and Cuyskens 2007: 18). Главным достижением этого последнего течения является объединение мощной теоретической базы

когнитивной лингвистики с эмпирическими методами анализа (в частности, методом анализа языковых корпусов) (Heylen et al. 2008: 92).

Предлагаемое исследование базируется на данных «Українського асоціативного словника» (Мартинек 2007). Представляется, что ассоциативный эксперимент является методом, результаты которого отвечают требованию психологической достоверности.

Наука знает немало попыток классификации ассоциативных реакций. Однако, несмотря на огромное количество предложенных исследователями классификаций, Д. Слобин отмечает, что хотя они «очень остроумны, не совсем ясно, к каким выводам они могут привести, как определяются их основы и каковы их пределы» (Слобин 1976: 141). Однако на самом деле создание исчерпывающей и непересекающейся классификации ассоциативных реакций в рамках современной когнитивной лингвистики теряет свою значимость (ср. с замечанием Е. И. Горошко о том, что «построение некой идеальной классификации ассоциаций, основанной на некоем непротиворечивом принципе, не возможно и не нужно» – 2001: 254). Истинная цель исследователя заключается не в создании искусственной классификации полученных реакций, а в выяснении того, почему эти реакции возникли и какие концептуальные структуры сознания носителя языка и культуры они эксплицируют.

Поскольку «отношения между лингвистической формой и функцией отражают концептуальные структуры и общие принципы когнитивной организации» (Sweetser 1996: 4),

можно предположить, что ассоциативные реакции носят неслучайный характер и являются отображением коррелятивных концептуальных структур человеческого сознания. Применение теоретического аппарата когнитивной науки к анализу ассоциативных реакций позволяет утверждать, что они являются внешней экспликацией характерных особенностей соответствующего концепта и / или фрейма, в который этот концепт входит как составная часть более широкого фрагмента картины мира. Таким образом, ассоциативные реакции позволяют выявлять не только свойства определенного концепта, но и его связи с другими концептуальными структурами.

Например, реакции на стимул **свиня** эксплицируют представление о самом животном (1), различные фреймы, в которые оно вписано в сознании говорящих, или же вариативное значение слотов определенного фрейма (2), а также метафорическое переосмысление этого концепта (3); причем возможная более детальная классификация указанных групп реакций: (1) *рило 2,3%; рожева 1,4%; бежева; вгодована; жирна; породиста и др. – по 0,5%;* (2) *бруд 5,6%; сало 5,6%; село 3,8%; болото 3,2%; багно; брудно 0,9%; м'ясо 2,8%; Великдень; господарка; їжа; калюжа; корито; паишет; ринок; сало!!!; сви-нарник; смачна; стайня; стил; товар и др. – по 0,5%;* (3) *неохайність 1,9%; людина; підлість 1,4%; хам 0,9%; неакуратність; нечесна людина; образа; під столом; підложити свиню; підозра; підсунути; поганий вчинок; п'яний до упаду; сволота и др. – по 0,5%* (Мартінек 2007: 276).

Помимо того, ассоциативные реакции позволяют ответить на ряд вопросов, возникающих при изучении структуры когнитивной категории (см. дискуссию на тему Langacker 1987, Taylor 2003). Так, реакции на стимул **дерево** позволяют эксплицировать структуру этой категории базового уровня. Во-первых, полученные реакции дают возможность установить степень прототипичности единиц субкатегориального уровня, которые входят в эту категорию (4), во-вторых, эксплицируют характеристики концепта ДЕРЕВА различной степени выделенности (5):

(4) *дуб 18,2%; береза 5,9%, берізка 0,5%; липа 4,9%; яблуня 3,4%; клен 2,5%; каштан; сосна 2%; бук; верба; калина; черешня 1,5%; ясен 1% и ясен 0,5%; бамбук; кипарис; осика; тополя; фікус; явір; ялина и ялинка – по 0,5%;* (5) *зелене 10,3%; зелений 1,5% зелень – по 0,5%; високе 3%; листя 1% и листочки; листяне – по 0,5%; хвойне 1,5%; велике; крона; рослина; стовбур 1%; коричневе; коріння; корінь; обпале; плоди; рожеве; розложисте; смола; ягоди – по 0,5%* (Мартінек 2007: 102).

Таким образом, применение теоретического аппарата когнитивной лингвистики к интерпретации результатов ассоциативного эксперимента позволяет по-новому взглянуть на проблему классификаций ассоциативных реакций. Главная задача при этом состоит не в создании искусственной классификации полученных реакций, а в экспликации соответствующих концептуальных структур в сознании говорящего.

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КОГНИТИВНАЯ РАЦИОНАЛЬНОСТЬ И ЕЕ ЛОГИКО-МАТЕМАТИЧЕСКИЕ МОДЕЛИ

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На этапе постнеклассической науки возможна корректировка научной рациональности, рассматриваемой не как абстрактно-логический, но как социально-культурный, развивающийся структурно сложный феномен. Философы убедились, что строго теоретическое мышление не является и не может быть единственной формой научного мышления. Оно допускает и другие рациональные формы – эмпирическое мышление, здравый смысл, обыденное сознание. Такая рациональность не является жесткой познавательной процедурой, а допускает включенность субъекта в познавательный процесс, что расширяет возможности познания субъекта как носителя рациональности.

Чувственный и рациональный уровни познания, биосоциальная природа человека «проясняют» наличие двух дифференцированных срезов – эмпирического (онтологического) и гносеологического – в познающем «комплексе» субъекта, его психосоциальной «матрице» познания. Но человек – целостный субъект познания. В этом – его третья ипостась, в которой он синтезирует свою абстрактно-гносеологическую и логико-методологическую природу и форму, получает экзистенциально-антропологическое и «историко-метафизическое» осмысление. Познающий субъект предстает как гносео-онтический субъект – носитель: а) рациональности (гносеологический субъект) и б) иррационального (онтический субъект) – чувств, эмоций, желаний, настроений, интуиции, веры, сомнения, воли и пр. Субъект, интуитивно используя иррациональные формы как когнитивный инструмент, обнаруживает многообразие возможностей получения нового знания об объекте, о самом себе, о своих когнитивных возможностях и способностях. Эту неучтенную рационально-иррациональную бинарность субъекта, проявляющуюся в процессе научного познания на промежуточном этапе научного поиска и «блуждания» по лабиринтам сознания, и требуется обозначить.

Мы рассматриваем когнитивную рациональность как становящуюся категорию, обозначающую логическое познание с учетом дологических и антропологических особенностей

познающего субъекта. Основной атрибут познающего субъекта как носителя когнитивной рациональности – гибкость его сознания и деятельности. В понятии гибкости вычленим аспекты: 1) определенное непосредственно данное и явное качество субъекта, его первичную антропологическую и психологическую онтологию (чуткость, зоркость, проницательность, глубину, историзм мышления, диалектичность, мудрость, знание, высокую чувствительность, резонансную настроенность на объект); 2) качества субъекта, приобретаемые как новые во взаимодействии его с окружающей средой; 3) качества субъекта, формирующиеся, проявляемые в определенных обстоятельствах на основе определенной методологии, а до этого – «таящиеся», скрытые, латентные. Когнитивная рациональность как гибкая рациональность есть действие человеческого интеллекта в сфере науки на основе не только и не столько соблюдения логических законов и правил, сколько с учетом процесса и способов, методов получения знания, а также эволюции понимания знания самим субъектом. Такое представление о рациональности включает в себя более глубокое понимание возможностей познания, нежели в случае простого соблюдения законов и правил логики. Логические методы познания служат лишь инструментом познания. Главное в познании – деятельность ученого как субъекта познания и адекватное соответствие процесса получения знания, особых стандартов рассуждения субъекта процессу познания в целом. Субъект стремится адекватно отразить в вербальной форме все нюансы взаимосвязи с объектом познания, наиболее полно выявить особенности перехода от абстрактного к конкретно-всеобщему с учетом особенностей эволюции объектно-субъектной взаимосвязи. Такая когнитивная рациональность является гибкой. Она дополняет «классическую» (логически «жесткую») научную рациональность.

В философском смысле когнитивная рациональность как логическое познание и как атрибут гносео-онтического субъекта учитывает роль предпосылочного знания, методологии, культурно-исторических условий научного творчества субъекта и соотносит новые знания со своим прошлым посредством оборачивания метода и уплотнения научного знания, обнаруживая в себе ростки будущего. Гибкость сознания познающего субъекта рассматривается как эффективное свойство сознания, способствующее

совершенствованию, трансформации и модернизации методологии решения практических и теоретических задач, в выборе оптимального способа познания и деятельности, усмотрение в объекте скрытых, но познаваемых свойств, поэтапное разворачивание проблемы в научном поиске.

Исходя из данных соображений, когнитивная (гибкая) рациональность характеризуется нами как проявление человеческого интеллекта в сфере науки на основе не только и не столько соблюдения логических законов и правил, сколько с учетом целерациональности и целесообразности познавательного процесса, различных способов, методов (индуктивных, дедуктивных и др.) получения знания, а также эволюции понимания знания самим субъектом. Такое представление о рациональности включает в себя более глубокое понимание возможностей познания, нежели в случае простого соблюдения законов и правил логики. Когнитивная (гибкая) рациональность — это свободное развертывание ментальной сущности активно познающего субъекта, его самосознания в процессе деятельности.

Когнитивная (гибкая) рациональность свойственна постнеклассическому типу рациональности, сочетающему как диалектическое мышление, достигшее стадии конкретной всеобщности в теоретическом сознании, так и синергетическое мышление, демонстрирующее нелинейность, стохастичность процесса познания. Истоки когнитивной (гибкой) рациональности складывались и в других исторических типах рациональности. Гибкая рациональность предстает высшей формой стратегии научного познания.

Языком гибкой рациональности могут стать и являются, на наш взгляд, такие логико-математические методы, которые адекватны для решения определенных задач. Логика — это «глубинная структура» рациональности (И. Н. Грифцова).

Логико-математические методы по своей природе являются предельно рациональным, формализованным языком классической рациональности. Но не все аспекты, объекты, процессы и результаты деятельности познающего субъекта можно формализовать. Там, где возникают нестандартные задачи или решение стандартных задач требует нестандартных решений и методов, ведущих к искомому результату, необходимы иные способы познания, проникновения в новые закономерности. Отсюда возникает необходимость поиска адекватных для решения неформализуемых задач методов, в том числе — логико-математических.

Но и новые методы в свою очередь будут рациональными, логическими. Но они будут уже не стандартными, «жестко»-рациональными, а учитывающими или сохранившими, во-первых, нюансы промежуточных «блуждающих» поисков, отразивших специфику онтического познающего субъекта, а, во-вторых, открывшими резервы когнитивной мыслительной деятельности субъекта. Пересечение (конъюгация) этих обстоятельств приведет к созданию новых «неклассических», нестандартных методов благодаря эвристической роли гибкой рациональности как интуитивно-стратегической основы познания.

Гибкая рациональность «кристаллизуется», воплощается в определенной языковой форме, которая должна быть адекватной своему содержанию, тем самым она «толкает» субъекта как творческую личность на конструктивное открытие этой новой формы. Высший уровень гибкой рациональности достигает конкретной всеобщности посредством соответствующих логико-математических категорий, методов, форм, моделей. К таким логико-математическим моделям мы относим «иррациональную» математику, интуиционизм, размытые множества Заде, многозначную логику и др.

ОСОБЕННОСТИ ВЫЗВАННЫХ ИЗМЕНЕНИЙ СПЕКТРАЛЬНОЙ МОЩНОСТИ ПРИ ВОСПРИЯТИИ МУЗЫКАЛЬНОЙ ГАРМОНИИ У МУЗЫКАНТОВ И НЕМУЗЫКАНТОВ

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Исследование психофизиологических механизмов эмоционального восприятия является

одной из ключевых задач современной психофизиологии. В настоящей работе изучались вызванные изменения спектральной мощности (ВИСМ) при предъявлении консонансных и диссонансных аккордов, а также субъективное восприятие этих аккордов.

Методика. В эксперименте приняли участие 40 испытуемых (20 — со средним или высшим

музыкальным образованием, 20 – без музыкального образования) в возрасте от 19 до 34 лет. Во время записи ЭЭГ испытуемым в случайном порядке с равной вероятностью предъявлялись консонансные аккорды и диссонансные аккорды длительностью 1,5 с. После прослушивания каждого аккорда через 500 мс испытуемые должны были оценить свои эмоциональные ощущения. После удаления окулографических артефактов и исключения эпох с миографическими, двигательными и иными артефактами производилась полосовая фильтрация в следующих частотных диапазонах: тета-1 (4–6 Гц), тета-2 (6–8 Гц), альфа-1 (8–10 Гц), альфа-2 (10–13 Гц) и гамма (30–45 Гц). Для анализа вызванной синхронизации по каждому частотному использовались следующие схемы дисперсионного анализа с повторными измерениями. Для уточнения характера эффектов при наличии достоверных взаимодействий проводились локальные ANOVA по отдельным отведениям.

Результаты. Субъективные оценки по шкале «гармоничный – дисгармоничный» для консонансных аккордов были значимо выше, чем для диссонансных ($p < 0,001$) у немусыкантов, музыканты также оценивали консонансы как более гармоничные ($p < 0,02$). Для шкалы «приятный – неприятный» как музыканты, так и немусыканты оценивали консонансы как более приятные ($p < 0,01$), однако различия между категориями у музыкантов были несколько меньше. Различия между группами выявлены на уровне тенденций ($p < 0,1$). Анализ вызванных

изменений спектральной мощности показал, что зависимость вызванных изменений спектральной мощности от типа стимула наблюдалась в тета-1 и тета-2 диапазонах и была наиболее выражена во фронтальных областях коры. Для других частотных диапазонов достоверной зависимости ВИСМ от экспериментального условия выявлено не было.

Тета-1. Визуальный анализ усредненной кривой ответа выявил резкое увеличение мощности в нижнем тета-диапазоне в интервале 50–400 мс, достигающее максимума приблизительно к 200 мс с момента предъявления стимула, наиболее выраженное во фронтальных отделах коры для консонансных аккордов (см. рис. 1). Для профессиональных музыкантов характерна более высокая амплитуда пика ВИСМ в диапазоне тета-1, более короткая латентность пика, а также менее выраженная межполушарная асимметрия (см. рис. 2).

Тета-2. Визуальный анализ усредненной кривой ответа, так же, как и для нижнего тета-диапазона, выявил увеличение мощности в интервале 50–320 мс, достигающее максимума приблизительно к 180 мс с момента предъявления стимула, наиболее выраженное во фронтальных и фронтоцентральных отделах коры для консонансных аккордов. Для испытуемых без музыкального образования в данном диапазоне также характерна тенденция к смещению активации в левое полушарие.

Обсуждение результатов. Выявленные межполушарные асимметрии подтверждают

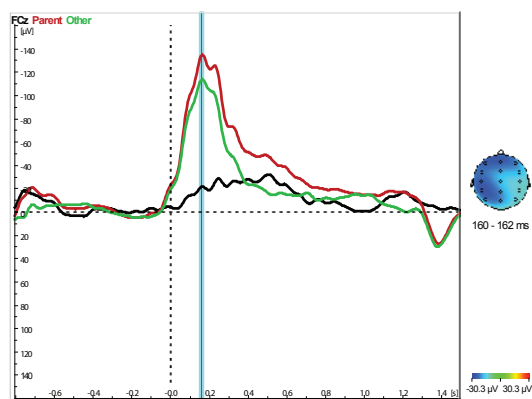


Рис. 1. Усредненные кривые вызванных изменений спектральной мощности в тета-1 диапазоне в лобном отведении (FCz) для консонансных и диссонансных аккордов, а также карта разности ВИСМ (синий цвет соответствует большему увеличению мощности для консонансных аккордов по сравнению с диссонансными) для испытуемых без музыкального образования.

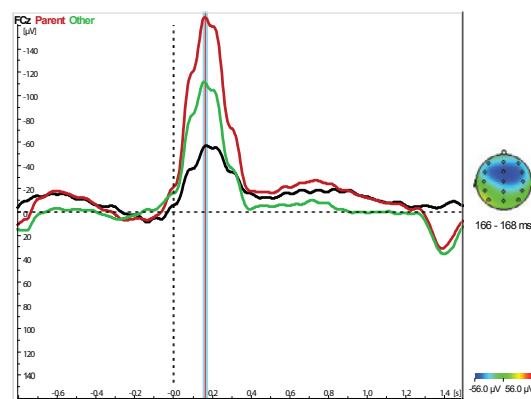


Рис. 2. То же для испытуемых с музыкальным образованием.

гипотезу В. Хелер и Р. Дэвидсона об участии передних отделов коры в определении знака эмоции, а также согласуются с информационной теорией П. В. Симонова. Вероятно, наблюдающееся у немзыкантов увеличение активации левой лобной области при прослушивании консонансных аккордов связано с восприятием консонансов как более приятных, что подтверждается данными субъективного отчета испытуемых. Таким образом, можно сделать вывод о том, что консонансные аккорды субъективно воспринимаются как более гармоничные и приятные, чем диссонансные, вне зависимости от музыкального образования.

Также при прослушивании консонансных аккордов происходит увеличение спектральной мощности по сравнению с диссонансными аккордами в верхнем и нижнем тета-диапазонах в префронтальных областях коры с пиком во фронтотемпальных отведениях. Однако межполушарная асимметрия выражена только у немзыкантов во фронтальных и центральных отделах коры, что говорит об эмоциональном восприятии гармонии людьми, не имеющими музыкального образования. У испытуемых с музыкальным образованием отмечается более короткая латентность пика ВИСМ в тета-диапазоне.

ВОЗМОЖНОСТИ СОВМЕЩЕНИЯ КАЧЕСТВЕННОЙ И КОЛИЧЕСТВЕННОЙ ОЦЕНКИ ДАННЫХ НЕЙРОПСИХОЛОГИЧЕСКОГО ОБСЛЕДОВАНИЯ ДЕТЕЙ МЛАДШЕГО ШКОЛЬНОГО ВОЗРАСТА

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Диагностика состояния высших психических функций (ВПФ) – одна из фундаментальных задач психологии. Актуальной проблемой современной нейropsychологии является создание единой батареи тестов для оценки ВПФ, совмещающей достоинства как качественного, так и количественного подходов (Симерницкая, 1991; Корсакова и др., 2001; Korkman et al., 1996; Kaplan, 1988; Milberg et al., 1986; Poreh, 2000). В МГУ под руководством Т. В. Ахутиной на

основе батареи тестов А. Р. Лурии был создан и апробирован набор нейropsychологических тестов для обследования детей 5–9 лет, уточнены и зафиксированы методические процедуры, а также способы обработки тестовых данных (Ахутина, Полонская и др., 2008).

Целью данного сообщения является описание важного шага количественной обработки нейropsychологических данных – выделения индексов. Этот шаг предполагает сложение показателей, направленных на оценку одного структурно-функционального компонента ВПФ. Такое объединение позволяет уменьшить влияние «шума» случайных колебаний при выполнении отдельных проб и вычлнять центральную тенденцию в результатах однонаправленных тестов, как это делает эксперт при качественной

	Дети с трудностями обучения			Дети с аутистическими расстройствами
	ТО-1	ТО-2	ТО-3	
Индекс программирования и контроля, серийной организации	85,8	50,6	50,3	75,9
Индекс левополушарной аналитической стратегии переработки информации	63,9	98,4	64,5	37,2
Индекс правополушарной холистической стратегии переработки информации	55,3	44,7	91	74,9
Индекс регуляции активации	66,7	57,5	63,7	76
Суммарная тяжесть	271,6	251,2	269,4	263,9

Таблица 1. Значения нейropsychологических индексов у групп испытуемых
Жирным шрифтом отмечены значимые различия ($p < 0,05$) между группами

оценке данных нейропсихологического обследования (Ахутина, Яблокова, Полонская, 2000). Выделение индексов рассматривается на примере обработки данных обследования детей с трудностями обучения и с расстройствами аутистического спектра.

Испытуемые. В исследовании участвовал 131 ребенок в возрасте от 8 до 10 лет (средний возраст 9 лет 1 мес.): 33 ребенка с аутистическими расстройствами (далее АР) и 98 детей с трудностями обучения (далее ТО).

Метод исследования. В статистическую обработку были включены результаты 15 нейропсихологических проб, которые оценивались по 132 параметрам. Анализ структуры проб позволил распределить параметры по основной направленности, отражающие состояние: 1) функций программирования и контроля деятельности, серийной организации движений и действий; 2) слухоречевых и кинестетических функций (аналитическая стратегия переработки информации); 3) зрительных и зрительно-пространственных функций (холистическая правополушарная стратегия переработки информации); 4) функций регуляции активации. Для выявления ведущих параметров, в большей степени отражающих состояние 4 групп функций, был проведен анализ ранговых корреляций Спирмена. Параметры, которые имели значимый положительный уровень корреляций, были включены в 4 основных нейропсихологических индекса: 1) Индекс программирования и контроля, серийной организации движений и действий (Индекс III блока); 2) Индекс левополушарной аналитической стратегии переработки информации (Индекс II-лев.); 3) Индекс правополушарной холистической стратегии переработки информации (Индекс II-прав); 4) Индекс регуляции активации (Индекс I блока).

По четырем индексам отдельно подсчитывалась сумма стандартизированных оценок по ведущим параметрам, и далее проводилось ранжирование этих сумм (низкий ранг соответствовал лучшему состоянию функций, высокий – худшему). Полученные каждым испытуемым четыре ранга сравнивались между собой.

В результате сравнения рангов дети с ТО были разделены на 3 группы: 34 ребенка получили высокие ранги по Индексу III блока, у них выявлена слабость функций программирования и контроля, серийной организации (ТО-1); 33 ребенка – по Индексу II-лев, у них отмечается слабость левополушарных функций переработки информации (ТО-2); 31 ребенок – по Индексу II-прав, для них характерна слабость

правополушарных функций переработки информации (ТО-3).

Чтобы оценить общий уровень развития ВПФ, у каждого испытуемого подсчитывался показатель Суммарной тяжести – сумма всех рангов по всем выделенным индексам. В нашем исследовании средние оценки четырех групп испытуемых значимо не отличались по данному показателю, что дает возможность сравнивать результаты выполнения проб у выделенных групп.

Распределение детей на группы в соответствии с ведущими отклонениями в развитии ВПФ дает возможность сравнивать нейропсихологические профили разных клинических групп. Так, в нашем исследовании были сопоставлены основные когнитивные нарушения у детей с ТО и детей с аутистическими расстройствами. Было выявлено, что у детей с АР обнаруживается слабость функций программирования и контроля деятельности, серийной организации движений и действий, сходная с группой ТО-1 (нет значимых различий по Индексу III блока: $U=449$, $p<0,2$). В той же степени для детей с АР характерны трудности переработки зрительной и зрительно-пространственной информации, слабость холистической стратегии, сходные с группой ТО-3 (нет значимых различий по Индексу II-прав: $U=399$, $p<0,13$). Также было выявлено, что Индекс регуляции активации значимо не отличался у всех исследуемых детей ($N=4,1$, $p<0,25$), однако сравнение по группам показало, что подобные трудности у детей с АР значимо выше в сравнении с ТО-2 (табл.1).

Заключение. Описанная процедура анализа результатов нейропсихологического обследования представляет собой сочетание качественного и количественного подхода к обработке данных, она в значительной мере воспроизводит логику эксперта, осуществляющего качественный анализ картины нарушения ВПФ. Такой подход к анализу данных позволяет количественно представить картину особенностей развития ВПФ у разных групп испытуемых и провести сравнительный анализ нейропсихологических профилей детей разных клинических групп. С ее помощью можно сопоставлять результаты и отдельных детей, строить индивидуальные профили развития ВПФ и количественно представлять неравномерность развития их психических функций. Данные таких профилей можно использовать для выработки стратегии и тактики коррекционно-развивающей работы с детьми.

УСЛОВИЯ АКТУАЛИЗАЦИИ ИНТУИЦИИ В РЕШЕНИИ ПРОБЛЕМНЫХ СИТУАЦИЙ

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Проблема исследования интуиции актуальна и значима в изучении творческого мышления, так как именно с интуитивным звеном связывается достижение творческого решения. В психологии мышления существуют различные подходы к пониманию сути процессов интуиции и их роли в решении, которые отражают полиморфность интуитивных процессов. Интуиция понимается как инсайт в гештальтпсихологии (М. Вертгеймер, 1987; К. Дункер, 1965); выступает в смысловой теории мышления О.К. Тихомирова (1969, 1984) как связанная с процессом неосознаваемого поиска, протекающего на операционально-смысловом уровне, и проявляющаяся в эвристической функции интеллектуальных эмоций; связывается с процессами прогнозирования в работах А.В. Брушлинского (1979); с возможностью осознания непрямого («побочного») результата решения задачи «на догадку» и включения его в дальнейший ход решения в исследованиях Я.А. Пономарева (1960, 1976); интуитивный выбор связан с возникновением ситуаций неопределенности в принятии решений (Т.В. Корнилова, 2010). Несмотря на неоднозначность понимания процессов интуиции, большинство исследователей подчеркивают необходимость включенности интуитивных звеньев в процессах реального творчества.

Одной из теорий, в которой как обязательное звено в решении творческой проблемы выступает интуиция, является теория проблемных ситуаций в мышлении А.М. Матюшкина (2009). Интуиция рассматривается в данном подходе как особая форма понимания смысла проблемной ситуации, предшествующая в структуре решения творческой проблемы возникновению семантического гештальта. А.М. Матюшкин (2003) выделяет ряд условий, при которых актуализируется интуиция в решении. Исходное условие для продуктивных процессов мышления – возникновение проблемной ситуации, когда данное субъекту задание воспринимается им как лично значимое, от решения которого он не может отказаться; другим условием является характеристика интеллектуальных и творческих возможностей субъекта – уровень его знаний, подготовленности, способностей должен позволять «присвоить» возникшую проблемную ситуацию.

В отношении актуализации процессов интуиции, обобщая, можно выделить ряд значимых условий, относящихся к характеристикам исходного задания и субъекта, решающего его. Задание должно быть таким, чтобы потенциально могло вызвать интерес у субъекта, актуализировав познавательную мотивацию. При этом, как было отмечено, уровень знаний, интеллектуальных и творческих способностей должен позволить субъекту решать возникшую проблемную ситуацию. Проблемное задание, служащее основой для возникновения проблемной ситуации, содержит скрытое знание (условие, способ, принцип решения), которое субъект должен «открыть» для себя в ходе решения, «догадаться». В решении реальных творческих проблем такого рода «подсказками» выступают любые стимулы, которые могут быть связаны с проблемой. В экспериментальной ситуации «подсказки» создаются специально в форме «наводящих задач», наводящих вопросов, ответов на вопросы испытуемого, возможностью получения дополнительного информационного ресурса по отношению к решаемой проблеме.

Данное представление об интуиции и условиях ее возникновения послужило теоретической основой проведенного нами эмпирического исследования, целью которого выступило изучение (моделирование) условий, при которых актуализируется интуиция. Объект исследования – проблемные ситуации мышления. Предмет – процесс интуитивного решения проблемной ситуации. Материал исследования – фрагменты киносюжета художественного фильма. Процедура исследования: испытуемому предъявляются для просмотра короткие фрагменты художественных кинофильмов (от 3 до 6 минут), содержание которых ему неизвестно. Испытуемому, на основе понимания смысла предъявленного фрагмента фильма, предлагают угадать исход представленной ситуации и дальнейшее развитие сюжета с помощью ряда наводящих вопросов, касающихся понимания: увиденного сюжета; понимания того, кем могли бы быть или являются герои фильма; вопросы, касающиеся понимания внутреннего конфликта, разворачивающегося во взаимодействии героев; вопросы относительно прогноза дальнейшего развития ситуации. После ответов на вопросы экспериментатор рассказывал предысторию предъявленного фрагмента художественного фильма, созданную режиссером, историю каждого героя фильма и его жизненную ситуацию

в развитии сюжета на момент предъявления фрагмента. После этого испытуемого просили ответить на вопрос о том, изменился ли его прогноз по отношению к предъявленной ситуации в связи с новой информацией и каким образом. В исследовании приняли участие 20 испытуемых в возрастном диапазоне от 19 до 25 лет с образованием гуманитарного профиля, характеризующиеся высоким уровнем абстрактного мышления (по результатам методики «сложные аналогии»). Гуманитарный профиль образования был выбран как фактор, обеспечивающий в большей степени субъективные возможности в разрешении данного типа проблемного задания. Решение заданий, использованных в исследовании, также требует сформированности абстрактного мышления. Выбранные фрагменты фильма содержали ситуации открытого и скрытого конфликта между героями. В качестве условия, обеспечивающего интерес и личностную вовлеченность испытуемого в процесс решения, то есть индуцирующего возникновение проблемной ситуации мышления, были выбраны сюжеты фильмов, в основе которых лежит сложный личностный морально-нравственный выбор героев. В обработке результатов был использован качественный анализ протоколов решения (фиксируются рассуждения испытуемого и экспериментатора вслух). В качестве критериев оценки решения, разворачивающегося в условиях возникновения проблемной ситуации, использовались следующие: субъективная самооценка интереса испытуемого к данному заданию; объективная оценка интереса испытуемого к заданию, выражаемая в желании узнать (в форме вопросов) окончание сюжета; количество проблемных вопросов, заданных испытуемым в ходе решения; нахождение принципа разрешения проблемной ситуации предъявленного кинофрагмента.

У 20 испытуемых, принимавших участие в исследовании, анализ типа решения свидетельствует о возникновении проблемной ситуации.

В оценке успешности разрешения проблемной ситуации с использованием интуитивного звена в форме догадки (приближенности ответа испытуемого к реальному развитию сюжета) выделено несколько уровней: 1) ответ испытуемого совершенно не совпадает с реальным развитием сюжета; 2) в ответе испытуемого имеются тенденции к правильному усмотрению сюжета (некоторые фразы, предположения, угадывание деталей), но он не останавливается на них; 3) испытуемый обнаруживает общий принцип развития сюжета, но не угадывает детали; 4) испытуемый угадывает принцип развития сюжета и сопутствующие детали. Ответов 1-го уровня среди испытуемых не было; большинство ответов относится к уровню 2, 3 (18 испытуемых); 2 испытуемых дали ответы 4-го уровня.

Таким образом, результаты проведенного нами эмпирического исследования подтвердили необходимость возникновения проблемной ситуации мышления как условия актуализации интуиции, при этом выявили различные уровни интуитивного решения. Самостоятельной задачей исследования для объяснения полученных результатов выступила оценка семантического потенциала личности, который со стороны субъекта обеспечивает возможности интуитивного решения проблемы.

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КОРТИКАЛЬНАЯ ГАММА-АКТИВНОСТЬ И ПОЗИТИВНЫЕ, СВЯЗАННЫЕ С СОБЫТИЕМ ПОТЕНЦИАЛЫ ПРИ ВЫПОЛНЕНИИ КРОЛИКОМ ЗАДАЧИ НА ВНИМАНИЕ

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Внимание лежит в основе поведенческой адаптации организма к условиям окружающей среды и является ключевым механизмом целенаправленного поведения человека и животных. Физиологическими коррелятами,

доступными для электрофизиологического изучения внимания на человеке и животных, являются длиннолатентные вызванные потенциалы (Наатанен, 1998; Polich, 2003 и мн. др.) и кортикальная гамма-активность (Думенко, 2006; Данилова, Астафьев, 2000; Debener et al., 2003 и мн. др.).

В то же время вопрос о временном соответствии и направленности изменений данных показателей в зависимости от уровня внимания и совершения/несовершения реакции остается открытым. В связи с этим целью нашей работы стало исследование кортикальной гамма-активности и связанных с событием потенциалов (ССП) как показателей внимания у кроликов в условиях парадигмы «активный одд-болл» и сопоставление их выраженности и информативности.

Эксперименты проведены на 13 кроликах при реализации ими парадигмы «активный одд-болл» (Семикопная и др., 2005). Значимые стимулы (ЗС) и незначимые стимулы (нЗС) подавали в квазислучайном порядке в соотношении 1:4 соответственно, что исключало следование подряд двух ЗС.

Серебряные регистрирующие электроды устанавливали в кости над лобной (Л), латеральной теменной (лТ) и центральной теменной (цТ) корой. Выбор данных точек обусловлен тем, что лобно-теменным областям коры больших полушарий отводится ведущая роль в организации внимания (Berger, Posner, 2000). Мощность гамма-активности анализировали после предъявления стимула в частотном диапазоне 28–68 Гц. Длиннолатентные позитивные компоненты идентифицировали в диапазоне 125–300 мс – P200 и 250–500 мс – P300. Для каждого кролика в каждом опыте проводили синхронное усреднение SSP (30–50 реализаций) в соответствии со значимостью стимула и поведенческой реакцией.

Нами установлено, что зарегистрированные электрографические показатели внимания у кроликов подчиняются определенным закономерностям при распознавании стимулов. Так, мощность гамма-ритма и амплитуда P200 и P300 модулируются двумя факторами: значимостью стимула и адекватностью выполнения инструментальной реакции в соответствии с условиями задачи «активный одд-болл». Указанные изменения носят однонаправленный характер и наблюдаются во временном интервале 125–500 мс после включения стимула.

Так, показано, что мощность гамма-активности была достоверно выше для ЗС в сравнении с нЗС в Л, лТ и цТ отведениях (критерий

Вилкоксона, $p < 0.001$), а также выше при сравнении выполнения правильной инструментальной реакции в ответ на ЗС с ее пропуском на этот же стимул (критерий Вилкоксона, $p < 0.001$). Более того, мощность гамма-активности была выше при совершении правильной реакции на ЗС по сравнению с ошибочной реакцией на нЗС (критерий Вилкоксона, $p < 0.01$).

При анализе параметров SSP нами показано, что амплитуда компонента P200 в Л отведении и P300 в Л и лТ отведениях была достоверно выше в ответ на ЗС по сравнению с нЗС (критерий Манн-Уитни, $p < 0.05$). Кроме того, выявлено достоверное увеличение амплитуды потенциалов P200 и P300 в Л и лТ отведениях в ответ на ЗС по сравнению с нЗС в ситуации выполнения инструментальной реакции на ЗС и правильного отказа от поведенческого ответа на нЗС (критерий Манн-Уитни, $p < 0.05$). Сравнение амплитуды волн P200 и P300 при совершении/несовершении животным реакции на ЗС показало, что в Л коре амплитуда компонентов достоверно выше (критерий Манн-Уитни, $p < 0.01$) при выполнении правильной инструментальной реакции на ЗС по сравнению с ошибочным пропуском ответа. А также амплитуда компонентов P200 во всех отведениях и P300 в Л отведении достоверно выше при совершении правильной реакции на ЗС по сравнению с ошибочным выполнением инструментального ответа на нЗС (критерий Манн-Уитни, $p < 0.05$).

Данные результаты указывают на то, что правильное распознавание стимулов и совершение адекватной реакции возможны только при определенном уровне внимания, который сопровождается повышением мощности гамма-активности и амплитуды позитивных компонентов СПП, а снижение внимания, а значит, и уменьшение мощности гамма-ритма и амплитуды P200 и P300, приводит к нарушению процессов идентификации стимула и совершению ошибочных реакций.

Таким образом, нами показано однонаправленное изменение параметров гамма-активности и SSP, которые отражают уровень селективного внимания к ЗС и нЗС, а также принятие решения о выполнении инструментальной реакции как правильной, так и ошибочной. Однако изменения для SSP были наиболее выражены в лобном и латеральном теменном отведениях от коры, в центральном теменном локусе отмечена сходная тенденция, в то время как изменения гамма-активности были достоверно выражены во всех исследованных локусах, что может являться преимуществом при исследовании процессов внимания. Выявленные нами

закономерности генерации гамма-ритма и ССП в связи с вниманием у кроликов сходны с установленными в работах на людях.

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СВЯЗЬ ХАРАКТЕРА ПЕРЕЖИВАЕМЫХ ЭМОЦИЙ С ХАРАКТЕРИСТИКАМИ СЛОЖНОСТИ ЭЭГ

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Изучение механизмов протекания эмоциональных процессов уже не первый год является одним из актуальных направлений науки. Работы в этой области направлены в основном на изучение влияния знака переживаемых эмоций на функциональное состояние головного мозга и на другие физиологические процессы. С нашей точки зрения, более подробное изучение нейрофизиологических процессов, сопутствующих эмоциям требует дифференцированного подхода к эмоциям, стимулируемым в экспериментах. Для этого необходима некая общепринятая система классификации эмоций, отсутствие которой затрудняет дальнейшее изучение этого класса психических процессов.

С другой стороны, теоретической основой наших исследований является системная психофизиология. В рамках этой парадигмы психические процессы рассматриваются как наблюдаемые проявления системных и информационных процессов в организме (Швырков, 1995, Александров, 2001). При этом построение единой психофизиологической теории возможно в терминах, описывающих как психические, так и физиологические явления на системном уровне. В наших предыдущих работах (Меклер, 2007, 2008) было показано, что в качестве одного из таких терминов можно рассматривать «сложность». Эта характеристика применима как для описания психических явлений, так и физиологических процессов. При этом возможна количественная оценка сложности сигнала электроэнцефалограммы (ЭЭГ) и модели порождающей его системы. В частности, было

показано, что при переживании положительных эмоций сложность системы, порождающей сигнал ЭЭГ, увеличивается по сравнению с отрицательными (Афтанас, 2000, Меклер, 2007). С точки зрения системной психофизиологии это объясняется тем, что отрицательные эмоции возникают вследствие неудовлетворения каких-либо конкретных потребностей и относящиеся к ним функциональные системы формируются для достижения конкретного результата, что уменьшает вариативность мозговых процессов, а также сокращает поведенческий репертуар.

Другой характеристикой, которая потенциально может описывать одновременно психические процессы и системные на физиологическом уровне, а также поведение, по нашему мнению, может быть их иерархическая организация. Для этого имеются теоретические предпосылки в психологической теории в работах многих авторов, таких, как Л. М. Веккер, Л. С. Выготский, в работах, посвященных организации мозговых процессов (напр., Эделмен, Маунткэсл, 1981), а также в работах Н. А. Бернштейна, посвященных организации моторной активности, и позже – Ю. И. Александрова, направленных на описание иерархии поведенческих актов.

В представляемой работе мы сравнивали изменения сложности сигнала ЭЭГ при стимуляции эмоций разного знака и относящихся к разным уровням иерархии психических процессов (Веккер, 1981).

В исследовании принимали участие 23 испытуемых – студентов Санкт-Петербургского государственного университета и Санкт-Петербургского государственного университета культуры и искусств. Процедура заключалась в просмотре видеороликов продолжительностью 1–3 минуты,

стимулирующих различные эмоции. Во время просмотра роликов осуществлялась регистрация сигнала ЭЭГ (19 отведений по системе 10–20). Испытуемые просматривали видеоролики, сюжеты которых были подобраны таким образом, чтобы вызывать положительные и отрицательные эмоции – равное количество видеороликов для стимуляции эмоций каждого знака. Кроме того, каждая группа роликов включала в себя две подгруппы – стимулирующие эмоции, относящиеся к нижним уровням психики – сугубо витальным, и относящиеся к верхним уровням, затрагивающим морально-этическую сферу. Данное разделение было сделано на основании теории психических процессов Л. М. Веккера (Веккер, 1981). Адекватность данного разделения проверялась с помощью самооценок субъективных ощущений испытуемых, а также экспертного анализа их мимики. Предполагалось, что, поскольку эмоции, относящиеся к верхним уровням иерархии, формируются в онтогенезе более поздно, соответствующие им функциональные системы более сложны и дифференцированы (Швырков, 1984, Александров, 1999). Как следствие, количественная оценка сложности наблюдаемых мозговых процессов также увеличится.

Для обработки выбирались очищенные от видимых артефактов участки ЭЭГ продолжительностью около 20 секунд, зарегистрированные ближе к концу просмотра видеоролика, поскольку едва ли можно рассчитывать на то, что сильные эмоции возникают непосредственно в начале просмотра.

Мерой сложности мозговых процессов может служить корреляционная размерность восстановленного аттрактора ЭЭГ. Её главное преимущество в том, что она непосредственно отражает сложность порождающей наблюдаемый сигнал системы. Однако в данном случае от неё пришлось отказаться, так как для её вычисления требуется довольно длинный временной ряд, полученный в результате наблюдения, и времени регистрации ЭЭГ оказалось для получения этого ряда недостаточно. В связи с этим мы использовали оценку фрактальной размерности кривой ЭЭГ (D_0), которая, в подобных ситуациях применительно к сигналам данного рода, косвенно отражает и сложность порождающей его системы (Pereda et. al., 1998).

Для вычисления этой величины мы использовали метод Хигучи (Higuchi, 1988). Далее был проведён статистический анализ результатов. Сравнивались средние значения D_0 ЭЭГ, зарегистрированных в пяти состояниях, – просмотр видеороликов, стимулирующих положительные и отрицательные эмоции, относящиеся к верхним и нижним уровням иерархии психики, а также просмотр эмоционально нейтральных роликов. Использовался дисперсионный анализ ANOVA по плану повторных измерений (repeated measures design) для каждого отведения регистрации ЭЭГ. При этом делались оценки уровня значимости различий согласно post-hoc LSD-критерию Фишера.

Полученные результаты в большой степени подтвердили наши предположения. Эмоции одного знака, но относящиеся к более высоким уровням иерархии, сопровождаются более сложной ЭЭГ; особенно сильно это проявилось при стимуляции положительных эмоций. При стимуляции отрицательных эмоций в левых фронтальном и заднетемпоральном отведениях, наоборот, даже наблюдается некоторое уменьшение величины D_0 . Знак переживаемых эмоций также влияет на сложность ЭЭГ, делая её более сложной при переживании положительных эмоций по сравнению с отрицательными. Этот результат повторяет результаты многих предыдущих исследований. Здесь необходимо заметить лишь то, что в данном исследовании это явление было ярко выражено при переживании эмоций, относящихся к высшим уровням. Изменение знака низших эмоций сколько-нибудь достоверно изменило D_0 лишь в отведении C_3 . Наконец, если выбрать в качестве опорного просмотр эмоционально нейтральных роликов, то относительно него происходит усложнение ЭЭГ при смене характера стимуляции в следующей последовательности: эмоции нижнего уровня отрицательные, нижнего уровня положительные, верхнего уровня отрицательные, верхнего уровня положительные. Усложнение ЭЭГ проявляется в увеличении уровня значимости различий и количества отведений, в которых эти различия наблюдаются.

Таким образом, подтверждается гипотеза о том, что характеристики сложности сигнала ЭЭГ несут информацию об иерархической организации психических процессов, протекающих в данный момент у человека.

АНТИЦИПАЦИОННАЯ СОСТОЯТЕЛЬНОСТЬ И КОГНИТИВНЫЕ ФУНКЦИИ В СИСТЕМЕ СТАБИЛИЗАЦИИ ЛИЧНОСТИ

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Система стабилизации личности – сложная, самоорганизующаяся, открытая, развивающаяся, неравновесная функциональная система, динамика которой подчинена нелинейной логике. Успешно функционирующая система стабилизации личности позволяет человеку планировать множество качественно различных траекторий адаптации, экологических для организма и психики. При появлении дисфункциональности в системе стабилизации личности возникает риск развития невротических и психосоматических расстройств, а также декомпенсации других психических заболеваний. Когнитивная функция антиципации отражает качество мыслительных процессов.

Исследования антиципационной состоятельности (прогностической компетентности), начатые в 1980-х годах в русле концепции неврозогенеза, в настоящее время развиваются по многим направлениям. Первое направление – исследование антиципационной состоятельности в связи с интеллектуальными функциями (Ничипоренко Н.П., Мухамадиева Г.Ф., Менделевич В.Д., 2010). Сравнительный анализ связей антиципационной состоятельности с успешностью в интеллектуальных тестах у здоровых лиц (55 чел., тест Р. Амтхауэра) и больных шизофренией с различной степенью интеллектуального дефекта (48 чел., тест Д. Векслера) позволяет утверждать, что в диапазоне низких значений интеллекта по сравнению с диапазоном нормы уровень развития и структура антиципационных способностей в большей степени зависят от параметров интеллектуальной деятельности. Т.е. интеллектуальная дезорганизация в большей степени влияет на антиципационную несостоятельность личности, чем сохраненный интеллект – на антиципационную состоятельность. Этот эмпирический факт свидетельствует о том, что прогностическая компетентность, безусловно, в той или иной мере детерминирована уровнем развития интеллектуальных функций. В условиях психической патологии эта связь более выражена и, следовательно, менее опосредована другими личностными свойствами. Интеллектуальный дефицит не позволяет полноценно функционировать когнитивному компоненту антиципационных способностей,

нарушая саму «механику» прогностической активности. В условиях психической нормы связи интеллекта и прогностической компетентности не столь линейны, однозначны и непосредственны. Сохраненный и даже высокий интеллект не гарантирует наличие развитой и эффективно функционирующей системы антиципационных способностей, а низкий уровень интеллекта еще не является прямым свидетельством антиципационной несостоятельности личности.

Второе направление – исследование антиципационной состоятельности в связи с личностными свойствами (Менделевич В.Д., Ничипоренко Н.П., Сумина Н.Е. 2007). На основе исследования (257 испытуемых, Фрайбургский личностный опросник и 150 испытуемых, СМЛ) мы пришли к выводу, что взаимосвязи прогностической компетентности с личностными свойствами малочисленны, не ярко выражены и недостаточно устойчивы. Взаимосвязи антиципационной состоятельности со свойствами личности, обеспечивающими успешность адаптации (уравновешенность, общительность) являются прямыми, а со свойствами личности, обуславливающими нестабильность психической сферы (невротичность, депрессивность, реактивная агрессивность, эмоциональная лабильность), являются обратными. Эти факты говорят о том, что антиципационная состоятельность является характеристикой, относительно независимой, автономной среди других личностных свойств. Прогностическая некомпетентность указывает на возможные нарушения в системе психической адаптации личности.

Третье направление – исследование функций антиципационной состоятельности в системе стабилизации личности (Менделевич В.Д., Ничипоренко Н.П., 2011, Абитов И.Р., 2007). На выборке объемом 167 чел. (Ничипоренко Н.П., 2011) сделаны следующие выводы: 1. Система стабилизации личности – функциональная система, определенная организация различных способов психической активности в данный фрагмент времени и в данных конкретных (стрессовых или нестандартных) обстоятельствах, обеспечивающая психическую стабильность, возможности адаптации, сохранность психического и соматического здоровья человека. 2. Структурообразующими компонентами системы стабилизации личности являются: антиципационная состоятельность, психологические

защитные механизмы и копинг-стратегии. 3. Чем менее развиты прогностические способности индивида, тем более нагруженными оказываются бессознательные способы адаптации к стрессовой ситуации, тем лучше работают психологические защиты, подстраховывая работу стабилизирующей системы в целом. 4. Общая прогностическая компетентность способствует предпочтению личностью конструктивных копинг-стратегий, направленных на анализ сложившейся проблемной ситуации и решение задач. Антиципационная несостоятельность связана с условно-конструктивным копингом, ориентированным на эмоции. 5. Субъектной характеристикой, организующей работу системы стабилизации личности в трудных жизненных ситуациях, является локус контроля. Статистически достоверны связи интернальной локализации контроля с пространственной и личностно-ситуативной антиципационной состоятельностью. 6. Нарушения одновременно в трех блоках системы стабилизации

личности — антиципационная несостоятельность, недостаточность защит и несформированный конструктивный копинг — ведут к развитию состояния психической декомпенсации, следствием которой может стать психическое или соматическое нездоровье.

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Ничипоренко Н.П. 2007. Прогностическая компетентность в системе личностных свойств // Вопросы психологии. 2007. № 2. С. 123–130.

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Н.П. Ничипоренко, Г.Ф. Мухамадиева, В.Д. Менделевич. 2010. Взаимосвязь антиципационных способностей с характеристиками формально-логического интеллекта в условиях психической нормы и патологии. Психическое здоровье. 2010. № 10. с. 35–38.

ВЫРАЖЕННОСТЬ ИЛЛЮЗИИ ВАЗАРЕЛИ В ТРЕХМЕРНОЙ КОНФИГУРАЦИИ

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Классический стимульный материал к иллюзии Вазарели представляет собой не менее 7 наложенных друг на друга квадратов, размер которых меняется от большего к меньшему, а светлота равномерно распределяется от черного к белому. Иллюзорный эффект проявляется в том, что наблюдатель отчетливо видит яркий крест, локализованный по диагоналям квадратов. В рамках трехуровневой модели обработки зрительной информации (Adelson 2000) классическое объяснение этой иллюзии основано на 2 механизмах, а именно: на сенсорном механизме латерального торможения, действующем на уровне сетчатки, и механизме заполнения (filling-in), действующем на кортикальном уровне. В пользу важной роли механизмов кортикального уровня свидетельствуют данные, показавшие влияние геометрии линий, образующих стороны квадратов, на выраженность эффекта Вазарели (Menshikova, Polyakova 2009). Вопрос о том, влияют ли механизмы когнитивного уровня обработки

информации на формирование иллюзии Вазарели, не исследовался.

Гипотеза нашего исследования состояла в том, что преобразование двумерного паттерна иллюзии в трехмерную сцену путем введения признака диспаратности изменит выраженность иллюзии Вазарели.

Стимульный материал представлял собой 5 пространственных конфигураций иллюзии (рис. 1): 0 — классическая 2D-конфигурация; П1, 2–3D-конфигурации, образующие выступающие на наблюдателя пирамиды (с диспаратностью –5 рх (П1) и –10 рх (П2)); Т1, 2–3D-конфигурации, образующие углубляющиеся внутрь экрана туннели (с диспаратностью 5 рх (Т1) и 10 рх (Т2)). Стереопары этих конфигураций предъявлялись с использованием технологии малой виртуальной реальности (очки BP eMagin Z800 3D Visor).

Для изучения выраженности иллюзорного эффекта в 2D и 3D конфигурациях использовался метод парных сравнений Терстоуна. Стимулы разных конфигураций предъявлялись попарно в случайном порядке и сравнивались между собой. Наблюдатель в каждой пробе должен был выбрать конфигурацию с «более ярким крестом».

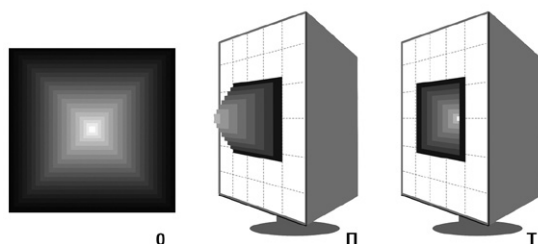


Рис. 1. Варианты пространственных конфигураций иллюзии Вазарели.

Участники. В исследовании приняли участие 25 человек (12 мужчин и 13 женщин) в возрасте от 17 до 30 лет с нормальным или скорректированным зрением. Перед началом экспериментальной сессии проверялось стереозрение участников.

Результаты. По результатам парных сравнений пяти вариантов иллюзии Вазарели (плоская иллюзия (0), две пирамиды (П1 – невысокая; П2 – высокая) и два туннеля (Т1 – неглубокий и Т2 – глубокий)) были построены порядковые шкалы выраженности иллюзорного эффекта – яркости креста (рис. 2).

Результаты исследования показали, что иллюзия в трехмерных вариантах выглядит ярче, чем в плоском. Иллюзорный эффект сильнее для более выраженных трехмерных форм: ранг 1 чаще (с частотой 0,76) получали конфигурации с большей диспаратностью (П2 и Т2).

Наблюдаемый эффект может быть объяснен проявлением такого феномена, как «эффект присутствия» (presence effect). Он проявляется в том, что у наблюдателя возникает комплексное субъективное переживание присутствия виртуальных предметов, что приводит к более сильным ощущениям их отдельных свойств – яркости, цвета, формы. Появление эффекта присутствия зависит от многих факторов, включая обстановку, контекст, личностные особенности и опыт наблюдателя, однако считается, что ВР-среда провоцирует возникновение данного переживания. В свою очередь, характерными его проявлениями являются большая реалистичность и яркость переживаний, эмоциональная вовлеченность субъекта, лучшее запоминание

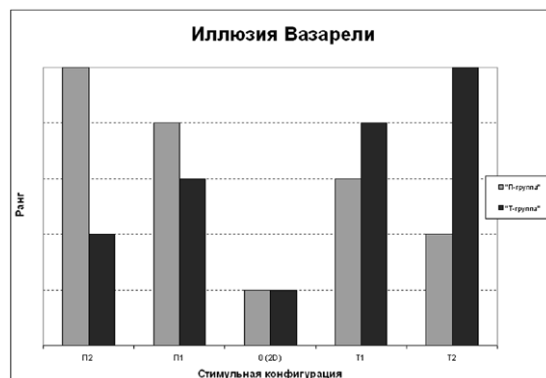


Рис. 2. Выраженность иллюзии Вазарели в 2D и 3D-конфигурациях.

им материала и др. Таким образом, предпочтение трехмерных конфигураций как более ярких в нашем эксперименте может быть вызвано тем, что при возникновении эффекта присутствия они выглядят как более реальные и предметные в сравнении с плоскими.

Вторым интересным результатом явилась обнаруженная нами взаимосвязь между конфигурациями, получавшими у одного и того же испытуемого первые два ранга: если 1-й ранг был присвоен пирамиде, то и 2-й ранг, как правило, тоже присваивался пирамиде; если 1-е место занимал туннель, то и 2-е – туннель. Таким образом, условно выделились группы, обладающие разными предпочтениями: пирамид (П-группа) и туннелей (Т-группа). У шести испытуемых распределение предпочтений не было выражено. Разделение выборки на П- и Т-группы также может быть связано с большей или меньшей «реалистичностью» конкретной пространственной интерпретации для разных участников эксперимента.

Вывод. Полученные результаты позволяют сделать вывод о том, что преобразование двумерного варианта иллюзии в трехмерный влияет на выраженность иллюзорного эффекта. Этот эффект может быть связан с механизмами когнитивного уровня, одним из которых является механизм «эффекта присутствия».

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Menshikova G.Y., Polyakova N.V. 2009. The strength of Vasarely and SLC illusions depends on line straightness. *Perception* 38, 95.

КОГНИТИВНОЕ ЗДОРОВЬЕ: К ВОПРОСУ ОПЕРАЦИОНАЛИЗАЦИИ ПОНЯТИЯ

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В последнее время в литературе все чаще употребляется термин «когнитивное здоровье» (Э. Голдберг, В. Д. Менделевич и др.), в который вкладывается разное содержание.

В настоящее время также широко используются такие понятия, как легкие, умеренные когнитивные расстройства, деменция (С. И. Гаврилова, И. В. Дамулин, С. Н. Иллариошкин, Н. Н. Яхно, В. В. Захаров и др.), которые можно рассматривать как разные по проявлению и степени выраженности расстройства когнитивного здоровья, не связанные с очаговым повреждением мозга, не приводящие к полной потере конкретного когнитивного навыка, но ухудшающие качество жизни человека. В то же время не разработаны критерии дифференциации этих видов расстройств, нет объяснительных толкований роли этиологических факторов, неясен характер общих или специфических причин, лежащих в основе разных форм когнитивного снижения. Это приводит к использованию диагностических средств, носящих общий, а не специализированный характер для обнаружения разных видов когнитивных нарушений. Примером этому является большая популярность и частотность использования такой разноплановой методики, как MMSE, для разграничения деменции от легких и умеренных когнитивных расстройств.

Ниже рассматриваются возможные принципы операционализации понятия «когнитивное здоровье» с позиции нейропсихологии и ряда смежных дисциплин.

Реализация когнитивных функций, лежащих в основе различных форм поведения человека, обеспечивается интегративной работой мозга и выступает условием, определяющим возможности индивида адаптироваться к среде. Нейрофизиологическую основу когнитивного здоровья можно рассматривать как сохранность интегративной работы мозга, обеспечивающую возможность осуществления взаимодействия различных областей мозга и возможность актуализации функциональных мозговых систем, лежащих в основе когнитивных функций. Психологической характеристикой когнитивного здоровья выступает возможность приобретения, сохранения и использования когнитивных навыков, умений.

Можно выделить ряд общих предпосылок формирования когнитивного здоровья, нормального когнитивного функционирования с учетом нейрофизиологической и психологической составляющих.

— *Морфологическое и функциональное созревание* различных мозговых структур, их связей и мозга в целом, на которое оказывает влияние ряд факторов, имеющих как биологическую, так и средовую природу (например генетическое, соматическое благополучие, питание, экология и т.д.). Реализация этой предпосылки связана со здоровым образом жизни.

— Наличие *благоприятной ситуации развития*, связанной с условиями социальной среды, окружающей ребенка. С одной стороны – это внутрисемейные отношения, в которых условием для нормального развития выступает благожелательная к ребенку семейная атмосфера, эмоциональный и физический комфорт и др.

С другой стороны – это создание образовательного пространства, учитывающего соответствие обучающих программ морфофункциональным возможностям созревающего мозга. Применение здоровьесберегающих технологий обучения связано с пониманием того, что преждевременная интенсификация тех или иных форм обучения приводит к перегрузке мозга, к различным нервно-психическим отклонениям. В то же время отставание в обучении может стать причиной недостаточно эффективного формирования когнитивных функций, обусловленного возможным снижением сензитивности соответствующих им мозговых структур. Реализация этих предпосылок связана с развитием института семьи, междисциплинарным сотрудничеством специалистов при формировании стандартов программ обучения и воспитания.

— Культура *сохранения и совершенствования* когнитивного здоровья, подразумевающая формирование интенции, устойчивой мотивации к непрерывному развитию познавательных способностей, лежащих в основе как профессиональных, так и общих свойств и качеств субъекта, развитие способности к осознанной саморефлексии своих когнитивных возможностей и их развитию. Реализация этой предпосылки связана с разработкой системы мер, поощрений, направленных на профессиональный рост, доступность различных форм дополнительного образования.

Можно выделить проблемы, касающиеся расстройств когнитивного здоровья:

- **профилактика** расстройств когнитивного здоровья связана с решением задачи раннего обнаружения заболеваний мозга и проведением мероприятий лечебного и тренингового характера для предотвращения их дальнейшего развития. Большое значение имеет разработка методов диагностики когнитивных нарушений в продромальный период, выступающих предикторами серьезных мозговых проблем.

- **диагностика** расстройств когнитивных функций как фактора, влияющего на возможности адаптации субъекта к среде, резко снижающего качество его жизни. Для этого необходима нейропсихологическая диагностика, обращенная, с одной стороны, на описание структуры дефекта когнитивных функций пациента (качественный, синдромный анализ), и, с другой стороны, на оценку степени выраженности когнитивных расстройств, динамику изменений нарушенных функций (количественный, психометрический анализ). Диагностика выступает

основой для правильного построения реабилитационной работы, направленной на восстановление когнитивных функций. Качественный анализ позволяет определить стратегию и тактику реабилитационной работы, количественный – ее успешность.

Необходима дальнейшая операционализация понятия «когнитивное здоровье», уточнение конкретных его составляющих, которая представляется возможной с позиции нейропсихологического подхода. Она может быть связана с более четким определением общих (нейродинамических, управляющих) и специфических (связанных с конкретными когнитивными функциями) факторов когнитивного функционирования как системного образования; с определением роли этих факторов в детерминации разных вариантов снижения когнитивного здоровья; с разработкой диагностических процедур, направленных на основные составляющие когнитивного здоровья.

НЕЙРОФИЗИОЛОГИЧЕСКИЙ АНАЛИЗ СТРАТЕГИЙ ОЦЕНКИ ПРОСТРАНСТВЕННЫХ ХАРАКТЕРИСТИК ЗРИТЕЛЬНОГО ОБРАЗА

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Зрительно-пространственные способности являются важной составляющей когнитивной деятельности человека. Они определяют его возможности во многих сферах деятельности, от навигационных задач до профессиональных навыков в архитектуре, инженерии, хирургии и других профессиях. Вопрос нейрофизиологических механизмов представления зрительного объекта в мозге человека остается одним из самых интересных и дискуссионных. В 80-х годах XX в Д. Марром была выдвинута идея об иерархически организованных этапах корковой переработки: чем ниже уровень иерархии, тем более элементарные характеристики образа анализируются в данной области коры. Эти представления получили множественные экспериментальные подтверждения. Тем не менее, вопрос о том, является ли восприятие целой формы суммой операций по выделению и анализу ее элементов и их реконструкции на высоких уровнях зрительной иерархии или этот процесс обладает определенной специфичностью, пока недостаточно ясен. Обязательной составляющей представления зрительного

образа в мозге человека является кодирование пространственных отношений между частями объекта, что определяется тем, что в реальной жизни человеку часто приходится восстанавливать сложные формы из разрозненных деталей, дополнять частично разрушенные конструкции, создавать новые объекты по разработанному плану, т.е. выполнять задачи, которые можно обозначить как зрительно-конструкторские. При этом зрительная система проводит оценку целого предмета, его деталей и их взаимного расположения, выполняет операции сравнения создаваемого объекта с эталоном.

Цель настоящего исследования – исследование роли различных зрительных корковых зон в анализе целого образа, составляющих его деталей разной сложности и их пространственного расположения при двух родах деятельности – спокойном наблюдении и решении зрительно-конструкторской задачи.

В первой серии опытов – задача спокойного наблюдения – при анализе вызванных потенциалов выявлены две стратегии раннего сенсорного анализа зрительных образов. Стимулами служили изображения, представляющих собой сочетание глобального (внешний контур) и локального (внутренние детали) уровней. Выделены две группы испытуемых, различающихся характером изменений ВП зрительных областей в ответ

на нарушение внешнего контура и разобобщение фигуры на локальные элементы разной сложности. В первой наблюдали ранние (100 мс после стимула) и регионарно-специфические реакции: в затылочной коре – прогрессивное увеличение амплитуды ранней позитивности P100 с максимальным ответом на простые элементы, теменная кора реагировала на изменение взаимного расположения деталей. Во второй группе реакции возникали позже (160–200 мс после стимула) и имели более локальный характер (нижневисочная кора правого полушария). Только в первой группе при фрагментации изображения снижаются связи между разными зонами зрительной коры и между зрительными и префронтальными областями. Оценка степени нелинейной корреляции выявила при фрагментации большую динамичность связей теменной, а во второй – нижневисочной коры. В этой серии впервые была обнаружена четкая связь стратегии сенсорного анализа с полом испытуемых с большей степенью корковой специализации и динамичности системы раннего анализа изображения в группе мужчин.

Во второй серии опытов у 32 здоровых испытуемых анализировали поведенческие и нейрофизиологические характеристики решения конструкторской задачи. Стимулами служили контурные черно-белые рисунки животных и объектов повседневной жизни, составленные из одних и тех же деталей, и предъявлявшиеся в целом виде и при трех вариантах трансформации: (1) смещение всех деталей в радиальном направлении и (2) и (3) аналогичное смещение в сочетании с поворотом всех деталей фигуры на $\pm 0-45$ и $\pm 45-90$ градусов. Показано, что трансформация изображения приводила к увеличению времени реакции и снижению вероятности правильных ответов, а наиболее драматичные изменения соответствовали наибольшему повороту деталей. В то же время характеристики раннего ВП ответа (100 мс) продемонстрировали достоверную зависимость от пола. Только у мужчин ранний (100 мс) ответ теменной коры, специализированной для оценки пространственных свойств объекта, связан с уровнем

трансформации фигуры: чем больше поворот деталей опознаваемой фигуры, тем выше ответ этой области коры. При ошибках амплитуда P100 снижена. У женщин в ВП не выявлено этапа, чувствительного к ротации деталей; изменения обнаружены позже, во временном окне негативности N150, отражающей раннее разграничение (discrimination) признаков, связаны с другим типом преобразования – разобобщением фигуры на детали, и локализованы в других зрительных зонах – затылочной и височной.

Таким образом, во второй серии получены новые данные о гендерной специфичности раннего детектирования пространственных характеристик образа в теменной коре мозга человека. С учетом литературы вопроса различных стратегиях распознавания сложных образов, можно предположить, что способность зрительной системы мужчин к раннему выделению конфигурационных изменений есть проявление, а возможно, и нейрофизиологический базис, «координатного» подхода, при котором используется метрическая, то есть, измеряемая система координат (1). Отсутствие этого свойства в группе женщин предполагает, что они при решении пространственных задач используют иной, т.н. «категориальный» подход, основанный на выделении определенных признаков, или меток, в окружающем пространстве.

Таким образом, данные, полученные в двух сериях экспериментов, свидетельствуют, что, несмотря на жесткую специализацию зрительных областей, характер их реакций и взаимодействия может определять различные стратегии обработки изображения. Полученные данные дополняют современные представления о связанных с полом различных стратегиях решения зрительно-пространственных задач, новым фактом, что их основой могут быть особенности раннего анализа информации.

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ВЛИЯНИЕ ЗРИТЕЛЬНОГО ВНИМАНИЯ И ПАМЯТИ НА ВЫРАЖЕННОСТЬ ФЕНОМЕНА СЛЕПОТЫ К ИЗМЕНЕНИЮ

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Широко изучаемый в настоящее время феномен слепоты к изменению (change blindness) – это выраженная неспособность заметить довольно крупные изменения объектов, находящихся в зрительном поле, если в момент изменения наше восприятие было прервано (например, в результате моргания, перевода взора или краткосрочного заслонения). Для экспериментальных исследований феномена «слепота к изменению» чаще всего используется методика мерцания, стандартная форма которой была разработана Р. Рензинком в 1997 г. [1]. В этой методике на экране монитора последовательно предъявлялись два почти идентичных изображения и отличались лишь одной деталью. Между этими изображениями предъявляется пустой экран, маскирующий происходящее изменение. Оказалось, что при таком мерцании изображений испытуемые с трудом обнаруживают даже значительные изменения.

Настоящая работа посвящена исследованию влияния зрительного внимания и памяти на выраженность феномена «слепота к изменению». На материале методики мерцания мы пытались выявить роль зрительного внимания и различных видов памяти в проявлении данного феномена.

В исследовании приняли участие 9 женщин и 11 мужчин с нормальным или скорректированным до нормального зрением в возрасте от 14 до 33 лет (средний возраст – 22 года). Создание методики и проведение опытов осуществлялись с помощью программы-конструктора «StimMake» (авторы – А. Н. Гусев, А. Е. Кремлев). Для диагностики внимания и памяти использовались когнитивные компьютеризованные тесты из нейropsychологической батареи CANTAB: «Проба на зрительно-моторную координацию» (Motor Screening), «Большой или маленький круг» (Big/Little Circle), «Отсроченный подбор фигуры по образцу» (Delayed Matching to Sample), «Узнавание зрительно-пространственных стимулов» (Spatial Recognition Memory) и «Узнавание зрительных паттернов» (Pattern Recognition Memory). Для оценки

памяти – «Объем зрительно-пространственной памяти» (Spatial Span), «Пространственная рабочая память» (Spatial Working Memory), «Быстрая обработка зрительной информации» (Rapid Visual Information Processing) и «Поиск зрительного стимула по образцу» (Match to Sample Visual Search).

Для оценки феномена «слепота к изменению» использовалась методика мерцания. На экране монитора испытуемому попеременно предъявлялись два изображения с квадратами, которые отличались друг от друга одной деталью, например, один квадрат мог появляться и исчезать или менять свои характеристики: цвет и пространственное расположение. Чередование изображений сопровождалось предъявлением пустого серого поля-маскера. Время экспозиции изображений составляло 400 мс, маскера – 200 мс. Чередование изображений продолжалось до тех пор, пока испытуемый не сообщал об изменении и останавливал предъявление, после чего должен был показать экспериментатору объект, подвергшийся изменению. Опыт состоял из 85 проб. В зависимости от числа объектов (5 или 20) и их расположения (регулярное или случайное), пробы составляли 4 уровня сложности по длительности поиска испытуемым изменения в изображениях.

Независимыми переменными нашего квази-эксперимента являлись: уровень сложности поиска и показатели эффективности выполнения указанных выше когнитивных тестов. Зависимые переменные – время поиска изменения и количество ошибок при отчете об изменении (неверная локализация, неверное опознание изменения или пропуск ответа).

В результате проведенного исследования была обнаружена зависимость между показателями зрительного внимания, памяти и выраженностью феномена «слепота к изменению». Результаты 2-х факторного дисперсионного анализа показали, что зависимость исследуемого феномена от показателя зрительного внимания и памяти опосредуется типом (сложностью) стимульного материала. К первому типу относятся изображения, содержащие 5 регулярно расположенных квадратов. Для этой группы обнаружена корреляция с результатами таких тестов внимания, как «Узнавание зрительно-пространственных стимулов» ($r = -0,57$, $p = 0,042$), «Узнавание зрительных паттернов» ($r = 0,64$, $p = 0,019$) и памяти «Пространственная рабочая память» ($r = -0,61$, $p = 0,026$).

Второй тип стимульного материала состоял из изображений 5 квадратов, расположенных случайно. Он имел корреляции со следующими тестами: исполнительных функций, рабочей памяти и планирования «Объём зрительно-пространственной памяти ($\rho = -0,76$, $p=0,002$), «Быстрая обработка зрительной информации» ($\rho = 0,64$, $p=0,017$) и «Поиск зрительного стимула по образцу» ($\rho = -0,77$, $p=0,002$).

Третий вариант стимулов заключал в себе изображения 20 квадратов, расположенных регулярно. Установлены следующие корреляции со следующими тестами: тесты зрительной памяти «Узнавание зрительно-пространственных стимулов» ($\rho = -0,66$, $p=0,021$) и «Узнавание зрительных паттернов» ($\rho = 0,74$, $p=0,037$).

Четвертый вариант изображений – 20 квадратов, расположенных в случайном порядке. Обнаружена достоверная корреляция с тестом «Узнавание зрительно-пространственных стимулов» ($\rho = -0,58$, $p=0,05$).

Особо отметим, что тест на зрительную память – «Отсроченный подбор фигуры по образцу», показал высокую корреляцию со всеми типами стимульного материала: для изображений с 5 объектами корреляция находилась на уровне 0,9 ($p<0,037$). В то время как для изображений с 20 объектами она достигла

уровня 1,00 ($p<0,017$). По-видимому, этот факт можно объяснить тем, что решение такой важной задачи, как поиск изменений в ситуации мерцания, имеет своим базовым компонентом зрительную память.

Полученные результаты свидетельствуют о значительном вкладе зрительной памяти в решении задачи поиска изменений при большом количестве неструктурированного материала. Также можно говорить о том, что для успешного поиска изменений в большом количестве структурированного материала большую роль играет зрительная память, в то время как рабочая память, планирование, внимание отходят на второй план.

Результаты исследования указали на сложность проблемы связи феномена «слепота к изменению» с индивидуальными различиями в когнитивных способностях, а также помогли выделить возможные направления развития дальнейших исследований.

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МЕТАФОРИЧЕСКАЯ КОНЦЕПТУАЛИЗАЦИЯ В БЛОГАХ И АССОЦИАТИВНЫХ ПОЛЯХ РУССКИХ И АМЕРИКАНЦЕВ

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В современных когнитивно-дискурсивных исследованиях метафора определяется как универсальный механизм мышления и познания действительности, для изучения которого все активнее привлекается метафорическое моделирование. С тех пор, как Дж. Лакофф и М. Джонсон доказали, что метафора является неотъемлемым элементом языка и мышления, важнейшей задачей исследования метафоры является достоверная идентификация и анализ метафорического языка в условиях его естественного функционирования – дискурсе, а не в искусственно созданных изолированных примерах (Lakoff, Johnson 1980, Steen 2010).

Дискурс представляет собой «двуединство процесса коммуникации и получающегося в ее результате объекта, т.е. текста» и тем самым

охватывает «все формы использования языка» (Кибрик 2008). Иерархия модусов дискурса («мысленный – устный – письменный») включает промежуточные типы дискурса, или субмодусы: например, устно-письменный, примером которого может служить электронная коммуникация (Кибрик 2003, 2008). В качестве другого субмодуса, занимающего промежуточное положение между мысленным и устным дискурсом, можно рассматривать ассоциативное поле (АП).

В основу нашего исследования положена гипотеза, согласно которой в разных субмодусах дискурса (тексте и ассоциативном поле) проявляются различия метафорического моделирования специального знания.

Цель работы состоит в выявлении особенностей метафорических моделей в двух субмодусах медицинского дискурса: блогах и ассоциативных полях русских и американцев.

Материалом послужили блоги на медицинскую тематику сайтов ведущих американских и российских журналов и газет («Time»,

«Healthland», «The New York Times» «Аргументы и факты», «Newsland» и др.) и данные психолингвистического эксперимента, проведенного в группах русских и американских испытуемых.

В исследовании применяется метафорическая модель медицинского дискурса, представленная двумя доменами ЧЕЛОВЕК и ПРИРОДА, состоящими из 4 базовых метафорических моделей (Человек как биологическое существо, Живая Природа, Неживая Природа, Человек как социальный субъект) (Мишланова 2002; Мишланова, Уткина 2008). Базовые метафорические модели включают все выявленные метафоры в дискурсе, которые распределяются по видовым, подвиговым и терминальным таксонам. Каждой из метафорических моделей дается качественная и количественная оценка, с помощью которой определяется доля каждой модели в концептуальной метафоре. Организация языкового материала внутри метафорической модели производится на основании определений, представленных в толковых словарях. Метафорическая схема дискурса выступает в качестве инструмента унификации метафорических моделей с целью сопоставления и сравнения результатов, полученных при исследовании разных типов дискурса.

При исследовании блогов были отобраны 645 (324 на русском языке и 321 на английском языке) контекстов метафорического употребления. Наиболее продуктивной сферой метафорического осмысления медицинского знания в текстах блогов как на русском языке, так и на английском оказалась модель **Человек как социальный субъект** (русский блог – 75%, английский блог – 78%). Второй доминантной моделью является **Человек как биологическое существо** (русский блог – 18%, английский блог – 15%). Модель **Природа неживая** занимает только 6% метафор в русском блоге и 5% – в английском блоге. При этом наименее актуализированной является модель **Природа живая** (1%) как в русском, так и в английском блоге (2%). Например: *И вирусы взрывают бедный организм в считанные часы; This separation between the virus and its producer is what confounds immune systems – they're always looking around for the wrong culprit.*

Для исследования ассоциативного поля применялся направленный ассоциативный эксперимент. В психолингвистическом эксперименте приняли участие 209 испытуемых (108 русских и 101 американец). Основным критерием отбора являлось отсутствие у испытуемых специального медицинского знания и опыта работы в медицинской сфере. Испытуемым предъявлялись

следующие стимулы: °«Здоровье похоже на...», «Болезнь похожа на...»; «Health is like...», «Illness is like...» (в группе американцев). Всего было отобрано 305 ассоциаций, которые были распределены по моделям метафорической схемы ассоциативного поля (АП) в каждом языке. Результаты проведенного анализа свидетельствуют, что самой активной метафорической моделью в обоих дискурсах является **Человек как социальный субъект** (русские – 40%, американцы – 58%), представленный таксонами **Виды деятельности** (*hiking, baseball, running*) и **Артефакт** (*мотор старой машины, бумеранг; money, flat tire*). Второй по активности метафорической моделью в русском языке является **Живая природа** (34%), представленная таксонами **Растения** и **Животные** (*яблоня; надломленная ветка; паук; комар; flower; leech*). Третья метафорическая модель – **Неживая природа** – одинаково активна в двух АП (в русском – 22%; американском – 23%), Модель объединяет таксоны **Время**, **Пространство**, **Природные явления** (*времена года, летний день, вулкан, the sun, rain*). Четвертая метафорическая модель **Человек как биологическое существо** является третьей по активности в АП американских испытуемых (15%) и самой малочисленной метафорической моделью в группе русских информантов (4%). Модель представлена таксонами **Физиология** и **Психология** (*здоровье маленького ребенка (до года); что-то крепкое, крупное, устойчивое; happiness; smile; a bad dream*).

Таким образом, при изучении метафоризации в медицинском дискурсе выявлено, что в устно-письменном субмодусе медицинского дискурса (блоге) имеется сходство между метафорическими схемами разных языков, в то время как в мысленно-вербальном субмодусе (ассоциативном поле) обнаруживаются различия. По-видимому, диверсификация метафорических схем в АП объясняется индивидуальными особенностями категоризации действительности, концептуализации знаний и опыта, а также лингвокультурным характером ассоциаций. Сравнение тенденций метафорического конструирования и описание конкретных метафорических схем двух типов дискурса позволяют выявить сходные, различные и специфические черты межкультурного характера и концептуализации медицинского знания на разных уровнях репрезентации концепта *медицина*.

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МОЗГОВЫЕ СИСТЕМЫ ИНТЕГРАЦИИ ПОСЛЕДОВАТЕЛЬНЫХ СОБЫТИЙ В ЕДИНЫЙ ОБРАЗ СЛУХОВОГО ВОСПРИЯТИЯ

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Введение.

Основное качество сознания и проявление его интегративных свойств наиболее ярко выражается в слиянии одиночных впечатлений в единый образ восприятия. Для исследования данного феномена была выбрана пороговая область слияния щелчков для слуховой модальности. Хотя в рамках общей психологии данный феномен неоднократно рассматривался (Вундт, 2002; Русалов, 1975), мозговые механизмы такой интеграции остаются не до конца изученными.

Постановка проблемы.

Основной задачей данного исследования стало выявление мозговых механизмов, лежащих в основе процесса интеграции последовательно поступающей информации в целостный образ восприятия. При этом применялась сравнительная схема для двух вариантов восприятия физически одного и того же стимула. Специфика восприятия данного стимула определялась за счет дополнительных условий эксперимента – задачи испытуемого. В эксперименте использовались различные последовательности равномерно предъявляемых коротких звуковых щелчков, следующих с частотой, близкой к критической частоте слияния щелчков (КЧЩ) (Русалов, 1975).

Можно предположить, что обработка стимулов в зоне неопределенности обеспечивается двумя системами нейронов, одна из которых отвечает за восприятие щелчков, а другая – за восприятие тонов. В пороговой зоне возникает конфликт – конкуренция за обработку поступающего сигнала. То есть выигрывает та система, на стороне которой в данный момент находится больше контекстных подтверждений или дополнительной информации. Гипотеза: существует структура (или система структур), «работающих» только в зоне неопределенности, их активность будет видна в зоне вокруг стимулов КЧЩ.

Схема эксперимента.

В эксперименте приняли участие 7 испытуемых (3 женщины, 4 мужчины), средний возраст составлял 30 (+/- 11 лет). Все испытуемые обладали нормальным слухом. Каждый испытуемый участвовал в двух сериях. Последовательность серий была случайной. В первой серии использовались стимулы, состоящие из пула щелчков, идущих со скоростью от 10 Гц до 30 Гц. Давалась инструкция ранжировать пулы щелчков от самых медленных до самых быстрых по шкале от 1 до 9. Во второй серии участвовали пулы щелчков от 23 до 45 Гц. Инструкцией было ранжировать тоны от самого низкого до самого высокого по шкале от 1 до 9. Таким образом, пороговая зона скорости следования щелчков была представлена в обеих сериях эксперимента. Но в первой серии данная область находилась вверху шкалы и воспринималась как тоны, в то время как во второй серии те же самые стимулы находились внизу шкалы и воспринимались как пулы отдельно идущих щелчков. Контролируемое экспериментальное воздействие (разный тип инструкции) и качество стимульного материала позволили сдвигать порог КЧЩ для каждого испытуемого в строго определенном направлении.

Этапы обработки данных.

Снималась ЭЭГ испытуемых, в дальнейшем фрагменты записи (5 мс до и 500 мс после начала последовательности) рассортировывались по стимулам (для каждой серии в отдельные файлы собирались стимулы одинаковой физической частоты). Далее, после очищения от артефактов и фильтрации в диапазоне 0.3–30 Гц, было разделение этих фрагментов ЭЭГ на две составляющие (соответствующую двухдипольной модели и оставшуюся часть) с помощью алгоритма MFS (Вартанов, 2002), после чего анализировалась только составляющая, соответствующая двухдипольной модели. Поиск дипольных источников осуществлялся в программе BrainLoc 6 (модель с 2 подвижными диполями, коэффициент дипольности не менее 0,95). Статистическая обработка полученных данных состояла в поиске кластеров, критерием

была частота встречаемости диполей с близкой локализацией (по соответствующим координатам). Определялись такие кластеры, количество диполей в которых коррелировало с изменением параметров стимуляции и с их психофизическими оценками для данной серии. Осуществлялся факторный анализ распределения диполей в кластерах в зависимости от экспериментальных условий и параметров стимуляции. Рассматривались два вида корреляций: по всему диапазону действия стимула (в этом случае найденные факторы считались тоническими) и отдельно для каждого окна латенций (величина окна составляла 50мс, использовались перекрывающиеся окна со сдвигом 25 мс, всего 19 временных окон). Диполи для выявленных кластеров накладывались на МРТ-изображения с целью идентификации соответствующей анатомической структуры мозга.

Результаты.

Интересной представляется картина активации структур, относящихся к фазическому фактору 1. Данная группа структур имела высокие коэффициенты корреляции с психофизическими данными в серии «тон»: наибольшая активность структур наблюдалась при низких тонах, с последующим уменьшением активности структур к высоким тонам.

Возможно проследить взаимодействие структур 2–7–10–20 (базальные ганглии – височная кора – лобная кора – височная кора). Вовлечение височной коры имеет разные знаки, на начальном этапе и на заключительном. Примечательно, что весь цикл длится порядка 100 мс и может быть примером повторного входа (Иваницкий, 3). Данный паттерн активации наиболее выражен при пороговых стимулах,

определении их как тон. Это заставляет предположить, что данная система складывается для решения задачи интеграции последовательных стимулов в единый образ.

Выводы.

В ходе экспериментов удалось подтвердить гипотезу о существовании разных систем, связанных с восприятием последовательных событий (щелчков), либо целостного образа (интеграция звучащих щелчков в тон). Согласно полученным данным, существуют отдельные системы для восприятия щелчков и тона, даже для идентичных физических стимулов. Были найдены разные группы структур, дифференцированно участвующие в различении стимулов. Активность структур могла носить тонический или фазический характер и коррелировала с психофизической функцией, построенной по ответам испытуемых. Интеграция щелчков в единый образ может быть в дальнейшем использована как параметр, чувствительный при модуляции функционального состояния. В дальнейшем планируется проверка выявленных зависимостей на основе локальной электростимуляции и соответствующего изменения функционального состояния определенной области мозга.

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ВЗАИМОДЕЙСТВИЕ ИМПЛИЦИТНЫХ И ЭКСПЛИЦИТНЫХ ЗНАНИЙ В ПРОЦЕССЕ НАУЧЕНИЯ: КАКОЕ ЗНАНИЕ ВАЖНЕЕ?

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Настоящая работа посвящена исследованию взаимодействия имплицитных и эксплицитных знаний субъекта, формируемых в процессе научения. В когнитивной психологии хорошо известен феномен имплицитного научения – это процесс, посредством которого человек приобретает знание непреднамеренно и при этом оказывается неспособен его эксплицировать, т. е. ясно выразить это знание вербально (Reber,

1967). Более того, в исследованиях показано, что попытки испытуемых эксплицировать свои знания в процессе решения задачи приводили к разрушению имплицитного знания и снижению эффективности (Reber, 1976). Аналогичный эффект был получен Пономаревым в исследованиях творческих задач, на основании чего он сделал вывод, что человек может решать задачу в двух взаимоисключающих режимах: интуитивном и логическом (Пономарев, 1976). Тем не менее, применение более чувствительных способов измерения, основанных не на вербальных отчетах испытуемых, а на рейтингах

их уверенности в ответе, показывает, что некое осознанное знание (метазнание) часто сопровождается имплицитное научение. Это проявляется в том, что в большинстве случаев уверенность испытуемых в ответе коррелирует с их правильностью (см. обзор: Иванчей, Морошкина, 2011). Иными словами, человек может давать ответ в задаче, не будучи способным сформулировать основания своего выбора, и при этом быть уверенным в его правильности. Как взаимодействуют имплицитные и эксплицитные знания, когда человек принимает решение, и какие из них пользуются приоритетом? На выяснение этого вопроса направлено наше исследование.

Мы полагаем, что неосознанно человек усваивает всю поступающую информацию, но осознает лишь ту, которая, согласно его представлениям о характере задачи, оказывается релевантна поставленной цели. В нашем эксперименте мы попытались смоделировать ситуацию, в которой испытуемый имеет возможность выполнять задачу как на основе имплицитных, так и на основе эксплицитных знаний. При этом имплицитно усваивается иррелевантная закономерность, сопровождающая изменение релевантных параметров. Затем создаются условия, в которых иррелевантная закономерность, усвоенная имплицитно, вступает в противоречие с эксплицитными знаниями испытуемого. Эта критическая ситуация позволяет оценить, какая из упомянутых систем знаний пользуется приоритетом.

Гипотезы: 1. Наличие неявной закономерности в последовательности стимулов будет способствовать повышению эффективности выполнения задач классификации вследствие имплицитного научения. 2. В ситуации противоречия между эксплицитным и имплицитным критериями выбора ответа при столкновении с новыми стимулами испытуемые будут руководствоваться имплицитными критериями.

В эксперименте приняли участие 78 человек, возраст испытуемых от 18 до 40 лет, 56 женщин и 22 мужчины, в основном студенты психологического факультета.

Стимульным материалом послужили изображения денежных купюр Сбербанка РФ номиналом в сто и тысячу рублей. В изображение тысячерублевой купюры были внесены изменения (например, отсутствовал герб), что придавало ей статус «подделки». Купюры без внесенных изменений считались «оригиналами». Задача испытуемых состояла в том, чтобы научиться как можно быстрее и точнее отличать поддельные купюры от оригиналов. Эксперимент состоял из

двух этапов: обучающего (с обратной связью) и тестового (без обратной связи).

Испытуемые были случайным образом разделены на 3 группы – две экспериментальные и одну контрольную. В двух экспериментальных группах предъявление купюр на первом этапе было сопряжено с иррелевантным признаком (смещением), задающим неявную закономерность – если предъявлялась подделка, она смещалась относительно центра экрана влево на 48 пикселей, если предъявлялся оригинал – на 48 пикселей вправо. На тестовой стадии экспериментальной группе № 1 (ЭГ1) новые подделки предъявлялись с конгруэнтным смещением (т.е. влево), тогда как экспериментальной группе № 2 (ЭГ2) новые подделки предъявлялись с конфликтным смещением (т.е. вправо). Обеим группам на тестовой стадии предъявлялись также новые оригиналы: половина – со смещением вправо (конгруэнтное смещение) и половина – со смещением влево (конфликтное смещение).

Контрольная группа (КГ) не обучалась закономерности сдвигов, все купюры в обучающей серии предъявлялись строго по центру экрана. Тестовая серия была идентична той, которую выполняла ЭГ2.

Анализ результатов проведенного исследования показал следующие эффекты:

1. **Эффект имплицитного научения:** в условиях, где релевантным признаком стимула (признаки подделок) сопутствуют неявные иррелевантные признаки (закономерные смещения), испытуемые справляются с поставленной задачей значительно успешнее, чем испытуемые, которые обучались только релевантным признакам (средняя эффективность ЭГ1+ЭГ2 = 72%, КГ = 65% правильных ответов, различие значимо при $p = 0.039$).

2. **Эффект переноса имплицитных знаний на новые стимулы:** в ситуации, когда 75% новых стимулов соответствуют усвоенной ранее неявной закономерности, а 25% противоречат ей (ЭГ1), эффективность классификации конфликтных стимулов значимо ниже, чем конгруэнтных (54% и 71% правильных ответов соответственно, различие значимо при $p = 0.01$).

3. **Эффект потери доверия к неявным подсказкам:** в ситуации, когда 75% новых стимулов противоречат усвоенной ранее неявной закономерности, а 25% соответствуют ей (ЭГ2) эффект переноса имплицитного знания отсутствует (эффективность классификации конфликтных и конгруэнтных стимулов составляет 68% и 70% соответственно, что статистически не значимо). По-видимому, это происходит вследствие потери доверия к неявным подсказкам и изменения

стратегии испытуемых с интуитивного принятия решения на строгое следование эксплицитному критерию (изменение стратегии зафиксировано по отчетам испытуемых, $p = 0.000$).

Итак, мы ожидали, что при столкновении с конфликтными стимулами испытуемые будут выбирать ответ, основываясь на имплицитных знаниях. Однако нам удалось зарегистрировать эффект переноса имплицитного знания только в ситуации, когда конфликтных стимулов было лишь 25%, когда же их количество было 75%, испытуемые перестали опираться на неосознанно усвоенное правило и перешли на строгое следование эксплицитным критериям. Этот результат говорит о том, что существует довольно чувствительный механизм, регулирующий взаимодействие имплицитных и эксплицитных

знаний. Мы полагаем, что субъективным проявлением работы этого механизма может быть изменение уверенности в ответе.

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НЕКОТОРЫЕ НЕЙРОХИМИЧЕСКИЕ АСПЕКТЫ СВЯЗИ ЗРИТЕЛЬНОЙ ПЕРЦЕПЦИИ С ИНТЕЛЛЕКТУАЛЬНЫМИ ОПЕРАЦИЯМИ

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Картирование корково-подкорковых систем интеграции (проекционных, ассоциативных и интегративно-пусковых образований) по различным когнитивным способностям, в рамках биохимических особенностей на макро- и микроуровнях до недавнего времени не было востребовано в нейронауках. Можно отметить лишь фрагментарные исследования по разрозненным вопросам нейробиохимических механизмов познавательной деятельности (см. материалы международных конференций по когнитивным наукам: Казань 2004, Санкт-Петербург 2006, Москва 2008, Томск 2010).

Мы продолжили нейробиохимический анализ одной из основных холинергических нейромедиаторных структур в организации познавательной деятельности, в частности, зрительном восприятии, как фундаментального базиса переработки внешней информации в головном мозгу.

Для биохимического исследования были сформированы две группы животных (кошки, $n=14$). Первая группа не испытывала трудностей в распознавании планиметрических фигур при решении когнитивных задач различной степени сложности на обобщение и абстрагирование (правильные ответы составляли не менее 90%, $p<0,001$). Вторая группа испытывала достоверные затруднения в тех же экспериментальных ситуациях (хуже решали задания на 15–20%,

$p<0,001$, критерии Вилкоксона-Манна-Уитни и Стьюдента).

Конкретным объектом биохимического анализа служили фракции синапсом и синаптоплазмы, извлеченных из зрительных полей O_{17} . В субфракциях синаптических мембран и синаптоплазмы синапсом изучали содержание ключевого фермента синтеза ацетилхолина (ХАТ), одного из важнейших медиаторных факторов для нормальной реализации ментальных функций. Анализировали синаптические мембраносвязанные и водорастворимые белки, общие сульфгидрильные группы (SH), их доступные и замаскированные формы, как молекулярные структуры, причастные к пластическим характеристикам активной зоны синапса. Из полей O_{17} выделяли фракции легких (С) и тяжелых (D) синапсом. Затем по оригинальной методике (Орлова и др., 1980) отдельно из фракции С и D препаративными методами изолировали верхние, средние и нижние субфракции синаптических мембран (C_2 , C_3 , C_4 и D_2 , D_3 , D_4), а также суммарные субфракции синаптоплазмы легких и тяжелых синаптических фракций, спектрофотометрически определяли содержание белка, общих и доступных в нативных белках сульфгидрильных групп. Значительная чистота выделенных фракций позволяла в целом по количеству белка судить о количестве соответствующих им структурных элементов синапсов. В каждой из выделенных фракций радиометрически определяли активность холинацетилтрансферазы (метод Фоннум). Сравнение между группами

животных проводилось по удельной (УА на 1 мг белка) активности фермента в субфракциях.

Результаты исследования показали, что у кошек, способных к нормальному восприятию и решению когнитивных задач (1-я группа), по отношению к кошкам со сниженными познавательными способностями, с частичным снижением перцептивного процесса (2-я группа), существенно и достоверно более низкое содержание белка, в верхних и средних субфракциях синаптических мембран легких синапсом (C_2 и C_3 , рис.1). В остальных субфракциях легких и тяжелых синапсом достоверных межгрупповых различий не выявлено. На фоне близких значений общего содержания тиоловых групп в субфракциях наблюдается закономерная тенденция к различиям между животными с хорошо и слабо выраженными когнитивными свойствами по количеству доступных и замаскированных SH-групп мембраносвязанных белков. Во всех мембранных субфракциях как легких, так и тяжелых синапсом содержание доступных SH-групп ниже (а замаскированных, соответственно, выше) у «способных» кошек по сравнению с кошками

со «сниженными» способностями. Это наиболее выражено в нижних субфракциях C_4 и D_4 . По содержанию SH-групп в субфракциях синаптоплазмы (CnC и CnD) обе группы имеют близкие значения. Поиски возможных корреляций метаболизма ацетилхолина в полях O_{17} с когнитивными способностями привели к заключению о наличии сложной зависимости, опосредованной биологическими сезонными ритмами. С течением времени абсолютные значения удельной активности ХАТ во всех фракциях последовательно меняются. Сезонные изменения УА ХАТ как среди самцов, так и среди самок характеризуются одними и теми же закономерностями, не зависящими непосредственно от «интеллекта». Одновременно с полом и когнитивными способностями оказываются связанными лишь количественные проявления сезонной динамики.

В целом, в обобщенной форме, фактический материал можно обсуждать с точки зрения химиоархитектоники и отражающей ее синаптоархитектоники неокортикальных зон, влияющих или отражающих в известной мере когнитивные способности.

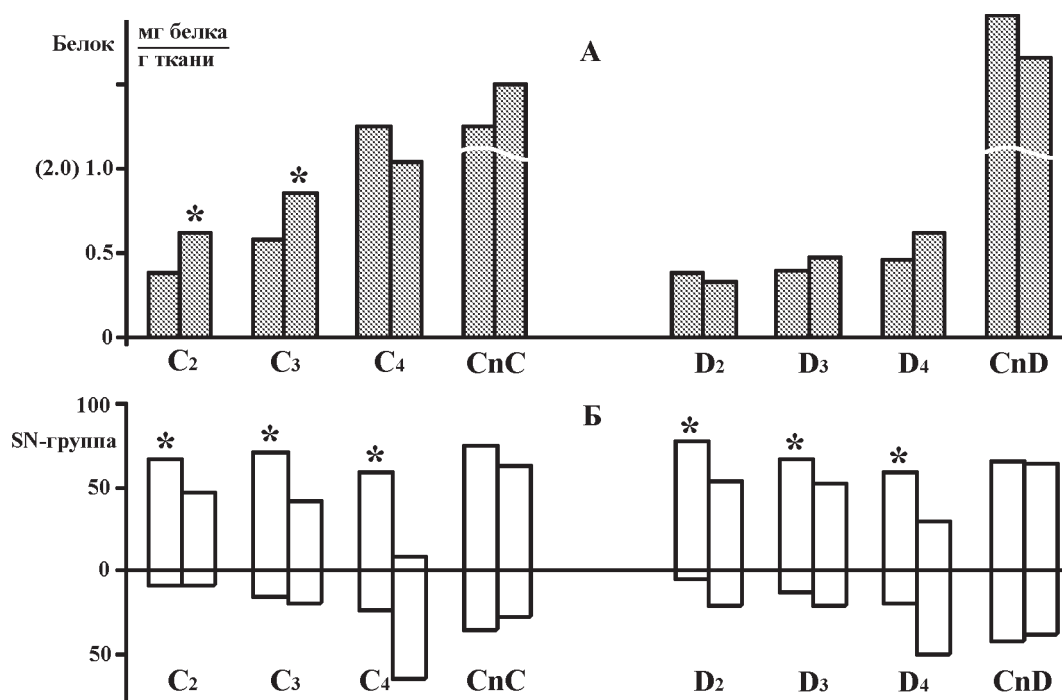


Рис.1. Содержание белка (А) и удельное содержание сульфгидрильных групп (Б) в субсинаптических фракциях полей O_{17} неокортекса кошек. В каждой паре левые столбики – кошки с выраженными способностями к решению когнитивных задач, правые столбики – кошки со слабыми способностями к решению когнитивных задач (А). В случае Б – наоборот, звездочками обозначены достоверные межгрупповые различия ($p < 0,001$). Б – по оси ординат вверх отложены значения доступных SH-групп, вниз – замаскированных. В сумме величины доступных и замаскированных SH-групп составляют их общее удельное содержание. Обозначения субсинаптических фракций – см. в тексте, ($n=7$).

ВЫПОЛНЕНИЕ ТЕСТА «ВЕРБАЛЬНЫЕ АССОЦИИ» У ДЕТЕЙ И ПОДРОСТКОВ С ФАРМАКОРЕЗИСТЕНТНОЙ ВИСОЧНОЙ СИМПТОМАТИЧЕСКОЙ ФОРМОЙ ЭПИЛЕПСИИ

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Согласно последнему определению Международной лиги борьбы с эпилепсией (ILAE), в клиническое описание эпилепсии и эпилептических синдромов следует включать не только иктальные события (собственно эпилептические приступы), но и интериктальные феномены (ухудшение качества жизни, психо-социальной ситуации, когнитивные, психологические и социальные следствия заболевания). Поэтому в настоящее время значительное внимание уделяется особенностям развития детей с симптоматической эпилепсией, подготовке и адаптации их к школе, трудностям обучения, возникающему у них нейропсихологическому дефициту, а также эмоционально-волевым и личностным особенностям таких детей.

Особый интерес представляет группа детей, страдающих фармакорезистентными формами эпилепсии. Это обусловлено все увеличивающимся количеством детей, попадающих в эту группу, и необходимостью их хирургического лечения, предполагающего оценку динамики нейропсихологических нарушений и прогноз хирургического лечения (Зенков Л. Р., Притыко А. Г. 2003, Berger et al. 1993).

Ведущая роль в генезе симптоматической фокальной эпилепсии отводится экзогенным факторам: это пре-, пери- и постнатальные поражения головного мозга, опухоли головного мозга, пороки развития коры головного мозга.

Формирование высших психических функций у детей и подростков, страдающих фармакорезистентной формой височной эпилепсии, происходит в дефицитарных условиях врожденных или ранних онтогенетических нарушений мозговой ткани (доброкачественные опухоли, склероз гиппокампа, фокальная корковая дисплазия) и требует перестройки функциональных систем.

Наибольший интерес в данном контексте представляет височная форма симптоматической эпилепсии. При височных фармакорезистентных формах эпилепсии в патологический круг, в первую очередь, вовлекаются медиальные височные структуры (в особенности, гиппокамп

и амигдала), неокортекс височной доли, а также ряд структур, относящихся к лобным долям.

В современных исследованиях, посвященных анализу речевых нарушений при данной форме, подчеркивается отсутствие прямой связи между локализацией очага в левой височной доле и обязательным дефицитом речевых функций, что связывается с высокой пластичностью мозга в детском возрасте, возможностью перестройки речевой системы и перемещения речевых зон ипсил- или контрлатерально (Троицкая Л. А. 2009, Liegeois et al. 2004, Loddenkemper et al. 2007). В качестве основных речевых трудностей у детей с височно-долевой фокальной эпилепсией выделяются нарушение импрессивной речи, трудности фонематического анализа и задержка речевого развития.

В данном исследовании состояние речевых функций оценивается с позиций сочетания количественных методов оценки и качественного нейропсихологического анализа нарушений ВПФ.

В исследование включены результаты 25 детей с диагнозом «Височная форма симптоматической эпилепсии» в возрасте от 8 до 15 лет, находившихся в стационаре НИИ нейрохирургии имени Н. Н. Бурденко РАМН.

С детьми проводились общее нейропсихологическое обследование по методу А. Р. Лурия, тест интеллекта Д. Векслера для детей (WISC-III-R), тест «Направленные ассоциации» (фонетические и семантические направленные ассоциации). Тест «Направленные ассоциации» является методикой, позволяющей оценить словарный запас и вербальный IQ ребенка, а также внимание, функции программирования и регуляции и нейродинамические характеристики деятельности (Strauss et al. 2006: 499–526). В данной работе соотносятся особенности выполнения теста «Направленные ассоциации» детьми с фармакорезистентной формой эпилепсии с результатами теста интеллекта Д. Векслера для детей (WISC-III-R) и данными нейропсихологической диагностики.

Дети с левополушарным фокусом эпилептической активности показывают большую продуктивность в тесте на направленные ассоциации по сравнению с детьми с правополушарным фокусом. Внутри каждой из групп продуктивность фонематических и семантических ассоциаций значимо не отличается. Эти результаты

противоречат некоторым ранее показанным данным (N'Kaoua et al. 2001), однако для их понимания необходимо обратиться к анализу профилей теста WISC-III-R и данным общего нейропсихологического обследования.

В группе детей с правым височным фокусом продуктивность фонетических направленных ассоциаций коррелирует с вербальным показателем интеллекта и баллами за субтесты «Словарь», «Сходство», «Понятливость» и «Осведомленность». Значимых корреляций продуктивности семантических ассоциаций и вербальных показателей интеллекта не выявлено. В группе детей с левым височным фокусом наблюдается обратная картина: выявляются корреляции между общим вербальным показателем, баллами за субтесты «Словарь», «Сходство» и продуктивностью семантических ассоциаций. В данной группе не было обнаружено значимой корреляции между продуктивностью фонетических ассоциаций и вербальных субтестов.

При соотнесении выполнения теста «Направленные ассоциации» и результатов общего нейропсихологического обследования выявляются различия в группе больных в зависимости от латерализации эпилептогенного поражения, представляется возможным проследить связь между характером выполнения

теста на направленные ассоциации и структурой нейропсихологических метасиндромов у детей, страдающих височной формой фармакорезистентной симптоматической эпилепсией.

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ИССЛЕДОВАНИЕ БЛИЗОСТИ КОМПОНЕНТОВ ПОЛИКОДОВОГО ТЕКСТА: ОПЫТ РАЗРАБОТКИ АВТОРСКОЙ МЕТОДИКИ

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Предметом нашего научного исследования являются проксимические сближения в поликодовых рекламных текстах. Нами выдвинуто предположение о том, что компоненты рекламных текстов могут вступать в отношения интерсемиотической проксимии, то есть восприниматься человеком как близкие по значению. Основой для установления человеком близости семиотически разнородных единиц является сравнение-переживание — переживание «сходства субъективных образов, имеющих двойное содержание: общая база знаний (коллективное знание) и личностное знание, связанное с личностным отношением человека» (Лебедева 2002: 179). Ключевую роль в акте проксимации играет внешний и внутренний контекст. Как правило, установление сходства происходит на основе какого-либо признака сравниваемых

единиц, который выделяется индивидом с привлечением различных видов знаний о мире под влиянием ситуации восприятия. Принято полагать, что в процессе переживания сходства происходит концентрация внимания на какой-либо одной особенности сравниваемых объектов, порой несущественной на первый взгляд, но актуальной для человека в текущий момент и «затмевающей» все другие признаки и характеристики (Залевская 2007). Доминантный признак, который является основополагающим для проксимического сближения сравниваемых единиц поликодового текста, может выделяться на основе опыта различного рода: эмоционального, когнитивного, перцептивного.

С целью верификации выдвигаемых теоретических положений о существовании отношений интерсемиотической проксимии в системе компонентов рекламных текстов, а также для определения некоторых особенностей опыта индивида, влияющего на установление близости значений текстовых компонентов, нами

разработана авторская экспериментальная методика, реализуемая в два этапа. Исследование осуществляется на материале рекламных текстов известных товарных брендов.

Первым этапом в рамках предлагаемой методики является направленный ассоциативный эксперимент. Он проведён нами на выборке в 100 испытуемых (17–25 лет, 51% женщин и 49% мужчин). В качестве слов-стимулов, на которые предполагалось получить реакции испытуемых, были выбраны три названия известных торговых марок: Coca-Cola, Билайн, Oriflame. Инструкция состояла в следующем: из 25 слов, напечатанных после каждого стимула, участники эксперимента должны были подчеркнуть слова, имеющие, по их мнению, сходство со стимульной единицей. В случайный набор существительных и прилагательных были включены номинации невербальных компонентов, часто используемых в рекламах данных марок. Так, для бренда Coca-Cola это были вербальные единицы «красный», «Санта-Клаус», «грузовик» и т.п. Данные слова были проверены с помощью Национального Корпуса Русского Языка (<http://www.ruscorpora.ru/>) на предмет встречаемости их в одном контексте с перечисленными выше марочными именами. Корпусный анализ подтвердил, что случаи использования этих вербальных единиц совместно с названиями исследуемых товарных брендов (расстояние – до 100 слов) единичны. Было разработано два типа анкет: с примерами рекламных текстов исследуемых брендов (тип А) и без каких-либо изображений (тип Б). В результате эксперимента подавляющее большинство испытуемых подчеркнули «ожидаемые» слова как имеющие сходство со стимульными единицами. Так, пара «Билайн – чёрно-жёлтый» была выделена как близкие по значению единицы в 94% анкет типа А и 88% анкет типа Б. В целом при использовании анкет типа А (с примерами рекламных текстов) было получено большее количество реакций, для многих единиц близость значения устанавливалась реципиентами несколько чаще, чем в тех анкетах, где не было иллюстраций. Детальный анализ результатов направленного

ассоциативного эксперимента приведён в нашей статье (Нежура 2011).

Второй этап реализации предлагаемой методики нацелен на подтверждение гипотезы о том, что установление сходства между гетерогенными текстовыми единицами может происходить на основе некоторого доминантного (в данный момент для конкретного реципиента) признака сравниваемых единиц. Актуальный для сравнения признак определяется человеком субъективно и не всегда осознанно. При этом ключевое значение имеет опора на образ мира в памяти, так как человеку свойственно сравнивать не два слова (или слово и рисунок), а два объекта действительности, информация о которых представлена в текстовом коде. Основой для сравнения-переживания могут быть знания индивида, связанные с опытом различного характера: эмоциональным, когнитивным (живое и энциклопедическое знания), перцептивным. Нами разработана авторская программа для ЭВМ, осуществляющая тестирование испытуемых с помощью метода семантического дифференциала (см. рис. 1). Текстовые единицы выбираются исследователем и могут варьироваться в зависимости от решаемых задач. Это могут быть как вербальные, так и невербальные компоненты, вводимые в память ЭВМ в рисуночном формате. Участнику эксперимента демонстрируется цельный текст, а затем предлагается произвести оценку параллельно двух единиц текста (также выводимых на экран) по заранее заданному семибалльному шкалам. Оценивая данные единицы по различным критериям, реципиент неизбежно сравнивает их. По завершении текста программа выполняет построение графика сходства исследуемых единиц в зависимости от полученных оценок. График состоит из двух линий, расположенных по две стороны от оси абсцисс. Если сравниваемые текстовые единицы получили разнополярные оценки, то линии максимально удалены друг от друга; если текстовые единицы оценены одинаково по данному признаку, тогда линии сливаются на оси абсцисс. Данный график представляет собой визуализацию, помогающую наглядно пронаблюдать, какие «точки пересечения»

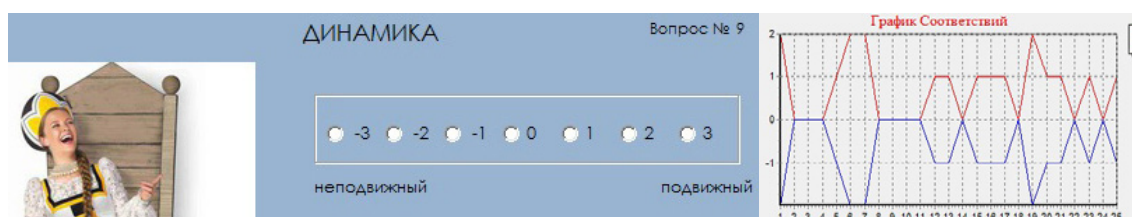


Рис. 1. Авторская программа, используемая на втором этапе исследования

могут иметь сравниваемые текстовые единицы. Результаты теста записываются программой как в индивидуальный для каждого испытуемого, так и в общий файл для возможности подсчёта среднестатистических параметров.

Таким образом, предлагаемая методика позволяет 1) зафиксировать факт интерсемиотической проксимии; 2) сделать некоторые выводы о природе опор, используемых человеком для установления близости значения единиц гетерогенного характера, функционирующих в поликодовых рекламных текстах.

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О КОННЕКЦИОНИСТСКОЙ МОДЕЛИ ПЕРЕВОДЧЕСКОГО БИЛИНГВИЗМА

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Переводческий билингвизм представляет собой особый вид (тип) билингвизма, названный французским теоретиком перевода Ж. Муненом (1978:37) «предельным случаем» языкового контакта и билингвизма, «где сопротивление обычным последствиям билингвизма более сознательно и более организованно». Формируется переводческий билингвизм в результате профессионального обучения и, в первую очередь, самообучения. Особенностью речемыслительной деятельности именно переводчика является обостренная языковая рефлексия, благодаря которой постоянно совершенствуются языковая компетенция переводчика и механизмы восприятия и порождения текста на двух (и более) языках.

К сожалению, в современной теории билингвизма сложилась, на наш взгляд, парадоксальная ситуация, заключающаяся в том, что переводческий билингвизм остается, как правило, вне поля зрения большинства исследователей, изучающих природу этого явления. Практически нет специальных исследований переводческого билингвизма, хотя совершенно очевидно, что этот вид билингвизма и, соответственно, языковое сознание и речевое поведение переводчика должны стать объектом комплексного (нейролингвистического и психолингвистического) когнитивного исследования, которое позволило бы прояснить механизмы соотношенного функционирования

двух языковых систем и кодового переключения в сознании переводчика, действующего в различных коммуникативных ситуациях. Как известно, психолингвистический анализ восприятия и порождения текста, освоение родного и иностранного языка и, соответственно, формирование билингвизма предполагает моделирование этих процессов. Среди имеющихся в настоящее время моделей наибольший интерес, на наш взгляд, представляют так называемые коннекционистские модели. Особенность коннекционизма заключается в том, что он исходит из положения о взаимосвязи всех когнитивных процессов и включенности всех знаний в единую ассоциативную сеть.

В коннекционизме процессы порождения и восприятия речи соотносят в рамках одной сквозной модели, что является несомненным ее достоинством. В реальных коммуникативных актах участникам приходится постоянно переключаться с порождения речи на восприятие. Как подчеркивала Т. Ахутина (1989), порождение и восприятие актуализированы одновременно в любом речевом акте, поскольку говорящий (пишущий) непременно выступает и как слушающий (читающий), так как слуховой и зрительный контроль реализации смысловой программы высказывания составляет необходимую процедуру речевой деятельности.

Другим очень важным положением коннекционизма является отрицание разделения лексики и грамматики как самостоятельных модулей ментальной репрезентации естественного языка, поскольку мозг представляет собой единую нейронную сеть, в которой сила связей между нейронами обусловлена частотностью их совместной активации. Частотность совместной активации нейронов отражает частотность

взаимосвязи воспринимаемых сигналов в перцептивном опыте.

Таким образом, основным отличием коннекционизма от других моделей ментальной репрезентации языка является взаимосвязь и взаимообусловленность всех единиц и уровней языка в сознании. В классической коннекционистской модели эта репрезентация выстраивается как взаимосвязь карт (арен): фонологической, (акустической/артикуляционной), морфосинтаксической (грамматической), лексической и концептуальной (MacWhinney 2005: 81–110). Ключевую роль играет понятие состязания (*competition*), которым обозначают отношения между языковыми единицами, активированными в процессе порождения и восприятия речи. В пространстве фонологической карты конкурируют аудиообразы и артикуляторные образы языковых единиц; в пространстве лексической карты – значения, приписываемые звуковому сигналу (или последовательности артикулем); наконец, в пределах морфосинтаксической карты состязаются аргументы предиката и модели порядка слов.

Благодаря такому структурированному представлению взаимосвязи всех единиц и уровней языка, коннекционистские модели предлагают удовлетворительный ответ на целый ряд принципиальных вопросов о строении языковой способности человека, обеспечивающей речевую активность. Это такие вопросы: какую роль в речевой деятельности играет оперативная память; каким образом новое языковое знание включается в когнитивное пространство индивида; почему при восприятии речи мы оперируем единицами различного масштаба; насколько психологически различны письменная и устная формы коммуникации; какое значение имеет частотность языковой единицы и почему частотность существенна для оперирования языковыми единицами в речевой деятельности.

Представляется, что в случае переводческого билингвизма коннекционистские модели позволяют объяснить и выявить способы оптимизации речевой деятельности, особенно в условиях синхронного перевода. Кроме того, именно переводческий билингвизм, предполагающий, как мы уже отмечали, развитую языковую рефлексию, включает в качестве необходимого компонента умение оперировать единицами различного масштаба и постоянно курсировать по маршруту «языковое знание – когнитивное пространство». Все это позволяет считать, что коннекционистская модель может и должна стать основой масштабного экспериментального исследования специфики профессионального переводческого билингвизма. Такое исследование должно включать, во-первых, ассоциативный эксперимент, направленный на выявление степени сбалансированности двуязычного лексикона. Во-вторых, интроспектирование с использованием метода «*think-aloud protocols*», позволяющего в какой-то мере «заглянуть» в работу сознания переводчика. В-третьих, необходимо создать репрезентативный корпус переводческих ошибок и провести их типологический анализ, что даст возможность выявить «критические точки» в соотнесенном функционировании языковых систем и в какой-то мере объяснить причину их появления. Кроме того, коннекционистская модель, на наш взгляд, может лечь в основу профессионального тренинга переводчика, основанного на принципе «ассоциативного научения».

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ВОСПРИЯТИЕ ЛИЦ ДЕТЬМИ И ВЗРОСЛЫМИ

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Лицо человека является самым главным источником информации о нем в межличностном взаимодействии. Это не только самое важное, но и самое первое «средство» социального взаимодействия. До 70-х годов прошлого века было

принято считать, что зрительная система новорожденных настолько несовершенна, что они видят мир как одно расплывчатое пятно. Однако в ряде работ было показано, что младенцы отдают предпочтение лицам и лицеподобным стимулам. Более того, на том расстоянии, на котором находится обычно лицо матери при кормлении, младенцы видят лицо достаточно четко, чтобы различать его мимику.

Документально зафиксировано предпочтение лиц у детей в возрасте 9 минут после рождения. Ко второму дню жизни младенец узнает лицо матери (эксперименты Бушнелл 2001).

Восприятие лиц иллюстрирует универсальный способ обработки информации – взаимодействие модальных и амодальных процессов. Амодальные или холистические (глобальные) коды осуществляют обработку информации по принципу типизации, тогда как модальные (аналитические, локальные) коды работают по принципу классификации. В процессе взаимодействия оба этих кода, обе системы работают параллельно, однако в зависимости от задачи один из кодов занимает доминантное, а другой – субдоминантное положение. Механизм типизации позволяет быстро, но очень приблизительно обработать информацию, в основном неосознанно, тогда как механизм классификации – более медленный, точный, – основан на осознанном переборе детальных признаков. Амодальный код, работающий по принципу типизации, многие исследователи сравнивают с «прототипом». Если говорить об уровне анатомо-физиологической организации перцепции, то холистическая и аналитическая обработка информации ассоциируются с магно- и парвоциллюлярными системами (М. Ливинстон и Д. Хьюбел, 1989, 1990. Цит. по Ментальная репрезентация, 1998, стр.10).

Правильное и быстрое распознавание основных индивидуальных характеристик человека – его пола, возраста (а также расы), так же как и восприятие эмоциональных характеристик, является жизненно важным для человека, включенного в социальное взаимодействие, и, по-видимому, должно обеспечиваться преимущественно базовым амодальным уровнем. Это предположение подтверждается как работами западных авторов (например, Tanaka & Farah, 1993; Bartlett & Searcy, 1993), так и нашими экспериментами, демонстрирующими преимущество холистического способа восприятия над аналитическим при решении такой сложной задачи, как опознавание пола новорожденных (Сергиенко, Никитина, 1999; Никитина, 2006).

Фиксация высказываний испытуемых при оценивании ими пола по фотографиям лиц показала, что даже при решении такой узкой и конкретной задачи большинство участников эксперимента формируют достаточно широкое представление об изображенном лице – относительно младенцев речь может идти об их здоровье, темпераменте (спокойный/неспокойный), привлекательности.

И действительно, каждое лицо несет в себе информацию разных уровней: индивидуальные характеристики (пол, раса, возраст, и др.) позволяют в самом общем виде оценить, кто находится перед нами, эмоциональные характеристики отражают чувства, переживаемые человеком в данный момент, на основании внешности можно сделать вывод и об особенностях личности, стоящего перед нами человека.

При этом часто интегральной характеристикой выступает привлекательность лица.

Дети 5–7-летнего возраста способны определять индивидуальные характеристики другого человека (например, пол, возраст) по его лицу, с точностью, превосходящей случайное угадывание, однако меньшей, чем у взрослых испытуемых. При оценивании ими фотографий более привлекательные люди получают и более высокие баллы по личностным характеристикам, но при перечислении качеств привлекательного сверстника мы получали либо максимально обобщенные определения, либо перечисление разрозненных свойств. Например, привлекательного мальчика его сверстники описывали как «хорошего», «доброего», «красиво одетого», а также «принца», «в белой рубашке» или даже «охотника с ружьем в охотничьих ботинках».

Испытуемые студенты более точны при распознавании пола по лицам, чем дети. Описание привлекательного человека уже включает в себя широкий спектр разноуровневых параметров, что подтверждается и результатами корреляционного анализа, демонстрирующими значимо большую интегрированность оценок привлекательности и индивидуально-психологических характеристик.

Полученные результаты могут быть интерпретированы с точки зрения развития представлений о другом человеке в интервале от старшего дошкольного до юношеского возраста. Дети 5–7 летнего возраста, находящиеся в норме на уровне наивного субъекта, хотя и признают наличие модели психического Другого, отличной от их собственной (Сергиенко, Лебедева, Прусакова, 2009), не способны еще ни выделить, ни вербализовать весь спектр значимых личностных характеристик другого человека, в то время как дифференциация представлений испытуемых старшего возраста оказывается связанной с интеграцией их в целостный образ Другого.

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О МНОГООБРАЗИИ СПОСОБОВ ПОНИМАНИЯ

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Оформление текстуального сознания. Опора на понимание при принятии решений – результат длительного развития мышления. Описаны периоды в истории человечества, когда поведение регулировалось логикой удовлетворения потребностей, логикой реагирования на стимул, логикой стереотипа, логикой социальной нормативности и, наконец, логикой смысла или логикой жизненной необходимости (Д. Леонтьев 2003: 155–156). Только в последнем случае учитывается определенным образом вся система отношений с миром и вся дальнейшая временная перспектива. Ориентируясь на смысл, человек поднимается над ситуацией. Провоцирующим фактором формирования феномена понимания явилось конструирование алфавита. Алфавит не только отделяет или абстрагирует друг от друга взгляд и звук, но и лишает звуковое проявление букв всякого смыслового содержания, так что «бессмысленные» буквы соотносятся с «бесмысленными» звуками. То, что языковой знак не мотивирован – произволен, по определению Ф. Соссюра, предполагает его осмысленность через включение в смысловую систему – текст. Смысл раскрывается лишь «письменному» человеку в качестве изнанки произвольности знака.

Гетерогенность текста. Как генератор смысла, текст принципиально гетерогенен и гетероструктурен. Еще со времен классической риторики в тексте были выделены три слоя. Слой предметный, слой логический и слой языковой. Каждый имел относительную самостоятельность, позволившую ему быть предметом анализа в своем разделе риторического канона. Предметный слой анализировался в разделе инвенции, понятийный слой – в разделе диспозиции и языковой слой – в разделе элокуции. Все вместе они служили оформлению текста в

определенную функциональную смысловую структуру. Нам важно отметить, что в каждом разделе речь шла о разных пространствах: предметном, понятийном, коммуникативном (речевом). Каждый раздел характеризовался своей логикой описания и способами работы с материалом. Движение от предметного пространства в сторону коммуникативного сообщало тексту риторическую функцию. Иные направления движений порождали такие функции текста, как конденсация информации (память), трансформация сообщения и выработка нового содержания, актуализация определенных сторон личности адресата, культурного контекста (Лотман 2002: 154–161). Понимание здесь выполняло функцию удержания целостности семиотических взаимоотношений внутри текстового пространства, иначе, смысловой наполненности текста.

Три способа понимания. За любым текстом, если это подлинное рассуждение, а не плагиат – вольный либо невольный, стоят вопросы, ответом на которые и может служить сам текст. Вопросы в тексте могут концентрироваться вокруг его трех составляющих: предмета, понятия, словесного оформления. Отсюда и выводилась трехуровневая система способов понимания текста. Еще Ориген сформулировал и подробно обосновал теорию трех «смыслов». Суть его учения сводится к утверждению, что – по аналогии с трехчастным составом человека, представляющего собою единство «тела», «души» и «духа», – в Писании можно усмотреть «телесный», «душевный» и «духовный» смысл, а коль скоро процесс духовного совершенствования человека и человечества может мыслиться как постепенное преодоление материального начала и достижение «духовного» состояния, то, соответственно, и раскрытие подлинного смысла Писания должно подразумевать последовательный переход от «телесного» смысла к более возвышенному «душевному», а затем – к «духовному». При этом Ориген уточняет, что под «телом» Писания следует понимать его

«букву», т.е. прямой и буквальный смысл сказанного в Библии, что «душевный» смысл — это нравственные наставления, содержащиеся в Писании, однако возмещаемые не в прямой и самоочевидной форме, а как бы обиняком, через подразумеваемое, и потому требующие отступления от плоского «буквального» понимания текста, и, наконец, — что «духовный» смысл Писания — это высший, мистический смысл христианского вероучения (Ориген. О началах). Впоследствии это разделение было перенесено и на другие, светские тексты. Три способа понимания — три семантические системы, которые должны быть скоординированы, соотнесены между собою, чтобы предстать смысловым целым — ликом текста.

Понимание как антитеза рефлексии. Текст, как предмет исследования, может рассматриваться под тремя углами зрения. Как отражение объектных отношений в мире: и тогда к нему применим естественнонаучный, в том числе и лингвистический метод анализа. Как орудие или средство взаимодействия и воздействия на других — это деятельностный, инструментальный подход. И как субъект порождения новых смыслов — это диалогический или коммуникативный подход, который формировался внутри семиотической парадигмы познания. В последнем случае текст имеет свои мотивы, смыслы, отличные от таковых у автора и у читателя (Эко 1990: 144). Здесь текст самоадресуется. Будучи включенным в коммуникативные взаимодействия, текст может быть подвергнут рефлексивным процедурам: комментариям, толкованиям, интерпретированиям, как и все другие компоненты коммуникативной ситуации. Но только из внутренней, самосознающей позиции текст может

быть понят (Яковлев: 63–66). В этой внутренней позиции конфигурирование смысла может протекать в трех направлениях под влиянием трех атомарных структур текста: языка, логики, предмета. Отсюда и появление возможных трех способов понимания: буквального, понятийного и паралогического (языкового). Но, в отличие от иерархии смысловых «сгущений» текста, как то полагала герменевтика, эти способы могут находиться друг с другом в диалогических отношениях.

Понимание есть спутник мышления на пути смыслового воплощения. Тем не менее, оно может сопровождать и другие процессы сознания: от восприятия до эмоционального состояния. Однако исследование понимания *sibi* — «самого по себе», в качестве самостоятельной функции, возможно лишь через текстовые воплощения. Этот текстовый смысл (как и нулевой знак в семиотике) должен быть опознан, чтобы служить опорой для последующих интерпретаций.

Технике текстовой самоадресации посвящено выступление.

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СРАВНИТЕЛЬНЫЙ АНАЛИЗ ВОСПРИЯТИЯ СТОХАСТИЧЕСКИХ СИГНАЛОВ ДЕТЬМИ 7–8 ЛЕТ С РАЗНЫМ УРОВНЕМ ИНТЕЛЛЕКТА

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Поиск методов, направленных на раннее выявление интеллектуальной одаренности у детей,— одна и важнейших проблем современной психологии (Алферов, 2002; Ушаков, Лобанов, 2009). Сенсомоторной интеграции отводится особая роль, т.к. она лежит в основе не только интеллектуальной активности, но и многих

других психических процессов, отражая интегративную деятельность мозга при реализации познавательных процессов (Ильин, 2003).

Кроме скоростных характеристик при анализе сенсомоторной интеграции, важную роль играет способность субъекта интуитивно оценивать структуру сенсорного потока, что отражает структуру селективного внимания (Каменская В.Г., 2005). Можно предположить, что интеллектуально одаренные дети, обладая более высоким уровнем селективного внимания, могут более эффективно воспринимать и фрактально организованные потоки

Параметры	Группа детей	
	Группа 1	Группа 2
Индекс Херста	0,62±0,06	0,56±0,02*
Среднее время реакции	131,7±125,9	134,5±145,3
Время реакции на звук	109,6±148,9	131,6±153,0
Время реакции на красный цвет	290,3±69,8	321,2±76,7
Время реакции на зеленый цвет	309,7±65,6	346,6±99,0
Время реакции на голубой цвет	288,5±81,0	333,4±112,1
Число фальшстартов	17,9±12,5	18,7±14,1

Таблица 1. Сравнительная таблица среднегрупповых показателей сенсомоторной интеграции в сериях с фрактальным режимом организации сигналов

Примечание: * – обозначены различия показателей групп с уровнем значимости $p \leq 0,05$. Группа 1 – дети с высоким уровнем интеллектуальной одаренности; 2 – дети с низким уровнем интеллектуальной одаренности.

сенсорных сигналов, и интуитивно улавливать структуру потоков, организованных случайно. Подтверждение этого предположения позволило бы получить еще один инструмент ранней оценки одаренности ребенка.

В обследовании участвовали 70 здоровых детей, из которых 40 мальчиков и 30 девочек в возрасте 7–8 лет.

Были использованы следующие методики: направленный ассоциативный эксперимент (Каменская В.Г., Зверева С.В., 2004); Цветные прогрессивные матрицы Дж. Равена (2001: 2002); компьютерный вариант комплексной рефлексометрии (разработка Урицкого В.М., Каменской В.Г.)

По результатам теста Равена дети были разделены на 2 полярные группы – с самыми высокими показателями теста и с самыми низкими.

При оценке рефлексометрии детям были предложены серии, в которых предъявлялись зрительные (цветные круги) и слуховые сигналы (гудок), организованные либо фрактально, либо хаотически. Более того, в одних сериях с простой сенсомоторной реакцией дети реагировали на все сигналы, тогда как в других (дифференцировочных) – они должны были не реагировать на круги красного цвета. Кроме того, в каждой серии оценивали индекс Херста, который отражает способность ребенка интуитивно предсказывать последующий сигнал.

Дети 7–8 лет с трудом приспосабливаются к меняющимся интервалам стимулов в сенсорном потоке. Дети хуже приспосабливаются к меняющимся интервалам в потоке акустических сигналов по сравнению со зрительными.

Интеллектуально одаренные дети одинаково предсказывают структуру как фрактально, так и случайно организованного потока, тогда как

их менее интеллектуально одаренные сверстники легче ориентируются в случайном потоке сигналов и не ориентируются во фрактально организованном.

Можно предположить, что способность ориентироваться в случайно организованной среде – эволюционное свойство животного, тогда как ориентация в неслучайном потоке – это и есть эволюционное свойство человека. Прежде всего, его наиболее интеллектуально одаренных представителей.

Таким образом, отличие интеллектуально одаренных детей от их менее успешных сверстников состоит именно в умении предсказывать структурированный поток сигналов.

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СЕРИИ ПОВТОРЯЮЩИХСЯ ЖЕСТОВ И СВЯЗНОСТЬ УСТНОГО МОНОЛОГА

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В общении большую роль (более 50%) играет невербальная составляющая, главным элементом которой являются жесты. Некоторые жесты входят в словарь, присущий говорящим на конкретном языке или относящимся к определенной социальной группе, но чаще всего они создаются в момент речи и не имеют заранее и навсегда закрепленного значения и формы. Жесты первого типа называются эмблематическими, второго типа – иллюстративными (см. напр. Крейдлин 2002). Иллюстративные жесты спонтанны, они присутствуют, даже если говорящий и адресат не видят друг друга (например, в разговоре по телефону). У детей жесты появляются раньше, чем развивается способность говорить (Bates 1976; Acredolo, Goodwyn 1988). Жестикулируют даже слепые от рождения (Iverson, Goldin-Meadow 1998). Многие исследователи уверены, что жестовая коммуникация предшествовала речи в истории развития человечества (Stokoe 2002; Tomasello 2008). Эти и другие наблюдения однозначно указывают на связь спонтанной жестикуляции, или иллюстративных жестов, и когнитивных процессов в мозге.

Жесты как ключ к глубинным процессам в сознании интересны еще и потому, что они сопровождают речь и при этом во многом отличаются от речи по своим свойствам (McNeill 1995: 2). Жесты не делятся на сегменты и не объединяются в иерархические структуры, в отличие от единиц языка. Жесты тяготеют к высказываниям, выражающим новую информацию с точки зрения содержания дискурса, ситуации общения или структуры рассказа. Таким образом, дискурсивная структура будет гораздо более заметна в жестикуляции говорящего, чем в речевом послании. Кроме того, жесты оказывают влияние и на сам процесс порождения речи и оформление мысли в высказывание (*thinking-for-speaking*), см. напр. Alibali, Kita, Young 2000.

В работах Николаевой (2009, 2010) рассмотрены некоторые способы, которыми жесты сигнализируют о структуре дискурса. В данной статье речь пойдет о таком явлении, как серии последовательных жестов. Дэвид МакНилл дал этому явлению название *catchment*. В русскоязычных источниках такое понятие не встречалось, поэтому мы будем пользоваться условным переводом «серии последовательных

жестов» или транслитерацией – кэтчмент. Это явление имеет место, когда одна или более характеристик кинетического знака повторяются по меньшей мере в двух жестах (не обязательно последовательных). Мысленный возврат говорящего к тому же визуально-пространственному представлению приведет к появлению жестов с повторяющимися особенностями. Такой возврат предполагает объединяющую тему для этого фрагмента.

В данном исследовании использован корпус видеозаписей устных рассказов, стимулом для которых послужил «Фильм о грушах» У. Чейфа (Chafe 1980). Этот короткий 6-минутный фильм без слов был специально создан для изучения разных языковых средств и стратегий. Его сюжет простой: садовник собирает с дерева груши, мимо проходит какой-то человек с козой; проезжавший мимо на велосипеде мальчик воспользовался тем, что садовник на дереве, и украл одну корзину, полную груш. Он едет дальше, встречает девочку на велосипеде и падает, наехав на камень. Трое других детей помогают ему подняться, он их за это угощает грушами. Садовник с удивлением обнаруживает пропажу корзины, и тут же мимо проходят дети с грушами.

Эпизоды в сопровождении кэтчментов, или серий повторяющихся жестов, можно представить как ось рассказа, на которую нанизываются все остальные события. И, кроме того, выявление таких эпизодов показывает, какие именно моменты в рассказе говорящий считает самыми важными (не обязательно осознавая это), и что требует от него дополнительных усилий для осмысления и встраивания в общую картину. При этом рассказчики могут использовать самые разные стратегии, показывая этим и свое личное отношение к фильму и просьбе рассказать о нем. Так, в одном из рассказов очень четко и последовательно перечислены все эпизоды фильма, причем появление кэтчментов четко соответствует движению камеры и появлению новых героев. В другом рассказе с помощью повторяющихся жестов выделены не все эпизоды, а только некоторые, но выделены подробно и детально: процесс сбора груш, описание корзин, как одну из них украл юный велосипедист, затем его падение, переход нескольких груш к другим детям. Особенно подробно отмечена реакция садовника на исчезновение корзины и появление детей с грушами. Кто-то из рассказчиков делит каждый эпизод на несколько более мелких,

подробно описывая, и словами, и жестами, все увиденное. Кто-то пытается увидеть связи внутри фильма, возвращаясь несколько раз к описанию словами и жестами пейзажа и груш (на дереве, в корзинах, в руках у детей). Если рассказчик не уверен в точности воспроизведения сюжета, то энтчменты с большой вероятностью будут группироваться в самых сложных для него местах.

Индивидуальные стратегии, как видно из примеров, могут быть очень разными. Спонтанные жесты, обычно не осознаваемые говорящим, могут дать подсказку относительно когнитивных процессов говорящего в момент коммуникации.

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О ПОЗНАВАТЕЛЬНЫХ СПОСОБНОСТЯХ В РЯДУ НАЗЕМНЫХ МЛЕКОПИТАЮЩИХ

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В настоящее время наибольшей популярностью пользуются три теории интеллекта позвоночных: теория адаптивной эволюции интеллекта и когнитивных модулей – нейроэкология (Shettleworth, 1998), нулевая гипотеза Macphail (Macphail, 1996, Macphail and Bolhuis, 2001) и теория энцефализационного фактора (Jerison, 1978). Причем идея четкой этапности в проявлении познавательных способностей у позвоночных в строгом соответствии с уровнем сложности и типом морфо-функциональной организации мозга остается весьма популярной.

На примере таких групп наземных млекопитающих, как европейский еж (*Erinaceus europaeus*), крысы (*Rattus norvegicus*), хори (*Mustela putorius*) и обезьяны (*Macaca mulatta*), в условиях свободного выбора была исследована возможность решения пищедобывательной задачи в многоальтернативном лабиринте, которая по своей семантической сложности представляла модельный вариант интеллектуальной деятельности человека: *если* после получения подкрепления в двух из четырех имеющихся в лабиринте кормушек самопроизвольно

покинуть пищевую среду и вновь в нее зайти, *то* всегда можно будет получать подкрепление в тех же кормушках.

Результаты исследования показали, что, несмотря на существенные различия в организации сенсорных, моторных, ассоциативных и интегративных систем, все изученные виды млекопитающих показали сходную стратегию обучения и правил формирования модели пространства, сходную последовательность изменений в поведенческой тактике при распознавании структуры задачи и организации целенаправленного поведения, основанного на прогностической активности. Примечательно, что использование традиционных количественных критериев – проб и времени обучения, фактически подтвердило идею о независимости познавательной активности от морфо-функциональных особенностей мозга, в том числе и от уровня цефализации (Macphail, 1996). Тенденция увеличения эффективности обучения от ежей к обезьянам не была столь существенна из-за большой внутривидовой вариабельности значений выбранных критериев. Обучение у всех животных начиналось с формирования «двигательного алфавита», который был сходен по количеству элементов и семантическому значению, на основании которого строились более

сложные ассоциации. Однако при выяснении содержательной стороны процесса обучения (как животные распознавали структуру задачи и формировали план поведения) были получены убедительные свидетельства положительной корреляции между познавательными возможностями животного и сложностью организации мозга. Наиболее существенные различия между видами проявлялись в параметре «когнитивных затрат», потребовавшихся на решение проблемы. Этот параметр, как оказалось, был более информативным, поскольку учитывал не только время, но и качественный состав ответа животного в течение эксперимента. Имея изначально сходный объем «двигательного алфавита», *интенсификация* ассоциативного процесса была тем выше, чем выше был уровень цефализации и лучше были представлены ассоциативные системы мозга в ряду наземных млекопитающих. Это позволяло животному не только более быстро ориентироваться в лабиринтном пространстве, но и обуславливало уровень представления о его структуре. Чем выше был уровень цефализации, тем легче животное улавливало признаки симметрии в лабиринте, тем чаще оно прибегало к операции переноса информации при моделировании «карты» всего пространства.

Определенные различия были выявлены и в последовательности операций при решении задачи. Четко выраженная этапность при выяснении структуры задачи, зависимость эффективности решения от полноты знания среды давали основание предполагать, что обработка семантической и синтаксической информации у них происходила последовательно. В тоже время характер решения задачи у более высокоорганизованных животных – хорей и, еще в большей степени, у обезьян свидетельствовал о возможности параллельной обработки информации. Важным, на наш взгляд, является тот факт, что переход от стохастического поведения к целенаправленному у хорей и обезьян приобретал все более скачкообразный характер.

С интенсификацией ассоциативного процесса улучшались и интегративные показатели в ряду наземных млекопитающих. Чем шире были представлены ассоциативные системы в ЦНС млекопитающего, тем меньше нужно было животному совершать ошибочных попыток (поисковых действий), чтобы распознать условие задачи. Этот факт можно рассматривать как свидетельство того, что определенные изменения

происходили в оценочном аппарате, поскольку информационный вес ошибки возрастал в ряду млекопитающих. Несмотря на то, что исследованные группы наземных млекопитающих мало различались по числу затраченных проб, переход на когнитивно-обусловленные формы ответа происходил тем быстрее, чем выше на эволюционной лестнице находилось животное. По мере усложнения организации переднего мозга все четче проявлялся феномен абстрагирования, когда роль подкрепления начинали выполнять не только физические ощущения от контакта с пищей, но и психические (сенсорная фиксация наличия пищи в кормушке). Увеличение числа таких проб в ряду наземных млекопитающих, особенно у обезьян, свидетельствовало о возрастающей роли психического фактора.

Таким образом, проведенный нами сравнительный анализ процесса обучения позволяет высказать представление о том, что рассмотренные группы наземных млекопитающих могут быть *интеллектуально близки* в том смысле, что в каждой из них имеются особи, способные в сходных условиях и сходным образом решать предложенную достаточно сложную когнитивную задачу, несмотря на серьезные различия в организации мозга. В то же время они могут быть *интеллектуально далеки* относительно технологического обеспечения этого процесса (Уголев, 1983), которое прогрессирует в ряду наземных млекопитающих, но эти изменения, по нашему мнению, не выходят за рамки количественных различий, обусловленных усложнением мозга.

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ФОРМАЛЬНЫЙ КОНЦЕПТУАЛЬНЫЙ АНАЛИЗ И НЕКОТОРЫЕ ПАРАДОКСЫ ЛОГИКИ ПОНЯТИЙ

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Согласно работе Гантера и Вилле (1999), *формальный контекст* – это структура $\mathbf{K} = (G, M, I)$, где G, M – произвольные множества и $I \subseteq G \times M$ – бинарное отношение между элементами множеств G и M . Элементы из множеств G и M называются *объектами* и *атрибутами* соответственно. В случае, когда $(g, m) \in I$, говорят, что объект g имеет атрибут m , или атрибут m присущ объекту g .

Формальный концепт контекста $\mathbf{K} = (G, M, I)$ определяется как пара множеств (A, B) , где $A \subseteq G$ – множество объектов с общим множеством атрибутов $B \subseteq M$, и каждый атрибут из B присущ всем объектам из множества A . Множества A и B называются соответственно *объёмом* и *содержанием* формального концепта (A, B) . Теоретико-множественное включение множеств объектов естественно определяет отношение порядка \leq на множестве концептов по формуле: $(A_1, B_1) \leq (A_2, B_2) \Leftrightarrow A_1 \subseteq A_2$.

Таким образом, в основу классического формального концептуального анализа положен *моноатрибутный* контекст – контекст с множеством атрибутов одного вида. Однако математическое моделирование многих прикладных задач приводит к *полиатрибутным* контекстам $\mathbf{K} = (G, M_1, M_2, \dots, M_n; \rho)$ с множеством объектов G и несколькими множествами атрибутов M_1, M_2, \dots, M_n , связь между которыми определяется $(n+1)$ -арным отношением $\rho \subseteq G \times M_1 \times M_2 \times \dots \times M_n$. Например, рассмотрим базу данных автомобилей, зарегистрированных в г. Калининграде. В этом случае множество G – это номер автомобиля, M_1 – это марка автомобиля, M_2 – тип раскраски, M_3 – это производитель, M_4 – это мощность двигателя, M_5 – год выпуска модели и т. д. Ясно, что множества M_i разной природы, даже если они выражаются одними и теми же числами. Поэтому эти разнотипные множества нельзя объединить, не нарушив отношения между ними. Причём, отношение ρ в нашем примере является однозначным относительно множества объектов G , т.е. каждому номеру автомобиля соответствует только один набор указанных атрибутов. В работе Новикова В.Е. 2010 показано, что множество концептов однозначного полиатрибутного контекста образует решётку и в нём так же присутствует соответствие Галуа между множествами объектов концептов, и

множествами их атрибутов. Соответствие Галуа свойственно любому отношению, и в случае формального контекста является отражением знаменитого закона логики понятий об обратном отношении объёма и содержания понятий.

Но в научной литературе можно встретить примеры, опровергающие этот закон, что противоречит чисто математическим и формальным расчётам. Однако, если рассматривать эти примеры с точки зрения формального концептуального анализа, все эти «парадоксы» сразу же исчезают.

Рассмотрим известный «парадокс Больцано». В нём взяты два понятия: «человек, знающий европейские языки» и «человек, знающий все живые европейские языки». Содержание второго из этих понятий считается шире, чем содержание первого (поскольку к характеристике языков добавляется признак «живые»), но объём этого понятия также шире, чем объём первого.

Формализуем этот пример средствами концептуального анализа. Пусть G – множество всех людей, M – множество всех языков, B_1 – все европейские языки, B_2 – все живые европейские языки, A_1 – люди, знающие европейские языки, A_2 – люди, знающие все живые европейские языки. Ясно, что $B_2 \subset B_1$ и $A_1 \subset A_2$, и никакого противоречия закону обратного отношения.

Объяснение этого «парадокса» связано больше с языком, чем собственно с логикой. В языке отдельные имена присваиваются не только отдельным объектам и атрибутам, но и целым понятиям. Другими словами, если вместо фразы «все живые европейские языки» вставить перечисление всех живых европейских языков «английский, итальянский, греческий...», и вместо фразы «все европейские языки» вставить перечисление этих языков «английский, древнеанглийский, итальянский, латинский, греческий, древнегреческий...», то парадокс исчезает. Фраза «все живые европейские языки» не является перечислением атрибутов, это составное имя для множества атрибутов, так же как и фраза «все европейские языки».

Другой пример. Одно понятие A_1 : «число, делящееся на 2 и на 3»; другое A_2 : «число, делящееся на 2, на 3 и на 6». Очевидно, что $A_1 = A_2$, но содержание B_1 понятия A_1 включается в содержание B_2 понятия A_2 . На самом деле понятие A_1 имеет два определения: «число, делящееся на 2 и на 3» и «число, делящееся на 6». Их объединение, естественно, включается в содержание, которое остаётся неизменным. Появление этого

«парадокса» обязано тому, что одно и то же понятие (концепт) может иметь несколько различных определений (минимальных генераторов).

Вот четыре определения потенциального векторного поля: векторное поле \vec{a} *потенциально* в области U : 1) если в этой области существует такое скалярное поле ϕ , что в этой области $\vec{a} = \text{grad}\phi$; 2) если в этой области $\text{rot}\vec{a} = \vec{0}$; 3) если циркуляция векторного поля \vec{a} по любому замкнутому контуру, лежащему в области U , равна нулю; 4) если линейный интеграл векторного поля \vec{a} вдоль пути, лежащего в области U , не зависит от пути, а зависит только от начальной и конечной точки этого пути. Обычно в качестве определения закрепляется одно выражение, а остальные доказываются как критерии этого понятия. Но в качестве определения можно выбрать любой минимальный генератор концепта. При этом минимальные генераторы образуют структуру, описанную в работе Новикова В. Е. (2006).

Ещё один пример: «Если в математике мы переходим от уравнения $x^2 + y^2 = 1$ к уравнению $ax^2 + by^2 = 1$, то объём понятия, связанного с этим уравнением, безусловно, увеличивается», — пишет Г. Клаус (1960).

Формализуем этот пример. Пусть A_1 — это множество фигур, задающихся уравнением

$x^2 + y^2 = 1$, A_2 — задающихся уравнением $ax^2 + by^2 = 1$. Ясно, что $A_1 \subset A_2$. Но можно ли написать $x^2 + y^2 = 1 \subset ax^2 + by^2 = 1$? В подобных определениях можно пользоваться таким правилом: «Можно ли найти систему выражений, определяющую A_1 , так чтобы её подсистема определяла A_2 , или наоборот?». И действительно,

система $B_1 : \begin{cases} ax^2 + by^2 = 1 \\ a = b = 1 \end{cases}$ определяет

концепт A_1 , а система $B_2 : \{ax^2 + by^2 = 1\}$ определяет концепт A_2 . Причём $B_2 \subset B_1$. Этот пример опять только подтверждает закон обратного отношения.

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НОВЫЕ ТЕХНОЛОГИИ УПРАВЛЕНИЯ АВТОБИОГРАФИЧЕСКОЙ ПАМЯТЬЮ: ИДЕОЛОГИЯ «ПРОТЕЗА» ИЛИ ИДЕОЛОГИЯ РАЗВИТИЯ?

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Анализ рынка психологических технологий показывает несомненное наличие социального заказа на средства регуляции автобиографической памяти (АП). Адекватный ответ на данный вызов особенно значим в силу того, что память современного человека имеет ярко выраженный «гибридный» характер, т. е. принципиально опирается на конфигурацию внешних средств, и без них уже практически немислима. Парадоксальность ситуации в том, что изобретения в этой области на сегодняшний день не опираются на определенную теорию АП и реализуют «фенотипическую», а не «генотипическую» стратегию моделирования. Иными словами, разработчики пытаются имитировать поверхностно наблюдаемую феноменологию АП (например, субъективную яркость и достоверность воспоминаний, запоминание как

полную хронику эмпирики жизненного опыта и др.), игнорируя скрытые закономерности, которые являются и результатом, и предпосылкой истории развития данной психической функции. Подобный подход мы характеризуем как «идеологию протеза», направленную на пассивное количественное замещение функции во внешнем плане без ее развития.

Для иллюстрации приведем систему Vicon Revue, базирующуюся на разработанной компанией Microsoft технологии Sensecam, которая представляет собой компактную фотокамеру, автоматически производящую 2–10 снимков в минуту. Vicon Revue носят на шее, фиксируя визуальную хронику прожитого дня (до 3000 снимков). Затем программное приложение формирует высокоскоростную презентацию из сделанных снимков. Предполагается, что ежевечерний просмотр презентации, механически смонтированной из подобной хроники, обеспечивает улучшение кодирования и извлечения в АП. Vicon Revue используется в

терапии пациентов страдающих болезнью Альцгеймера, однако прогнозируется его внедрение в практику здоровых пользователей (Bergu et al 2007).

Главными пунктами нашей критики устройств, выполненных в подобном ключе, являются: 1) апелляция к представлению мнемической единицы исключительно в визуальной форме (воспоминание – это яркая картинка), 2) минимальная возможность вербального означивания материала (из-за высокой скорости предъявления), 3) отсутствие эксплицитных правил организации мнемической деятельности, 3) адресация только к ассоциативному способу структурирования материала без учета семантических и смысловых связей, 4) игнорирование факта высокой селективности АП, 5) неэкологичность получаемой видеозаписи (камера находится значительно ниже уровня зрения пользователя).

В качестве альтернативы идеологии протеза мы предлагаем в дальнейших технических решениях опираться на идеологию развития, которая требует не количественного наращивания функции, а ее перестройки на новых основаниях, что должно привести к приобретению принципиально новых возможностей. При этом устройство должно «вдвигаться» между культурной (идеальной) формой и операциональным уровнем (элементами системы) и исполнять функцию опосредствующего их взаимодействие знака, что, безусловно, исключает прямое подражание наличной конструкции психической функции. Заметим, что в истории памяти таким изобретением стала фотография, кардинально преобразовавшая диахроническое самосознание человека.

Конкретной задачей нашего исследования стало создание средства для формирования психологической функциональной системы гибридного типа, обеспечивающего субъективное переживание и поведенческие последствия одного из малоизученных в современной психологии явления – феномена Мгновенного жизненного обзора. Заметим, что вопреки сложившейся традиции толкования данного феномена, Мгновенный жизненный обзор понимается нами как мнемическая иллюзия тотального автобиографического воспоминания, спонтанно возникающая в стрессовой ситуации и направленная на решение задачи обеспечения доступа к оптимальным обобщенным стратегиям решения жизненных задач, реализованных человеком в прошлом в комплексе с мотивационной реорганизацией личности на более высоком уровне функционирования (Нуркова, 2011).

Разработанное средство представляет собой синхронизированный аудио и видеоряд. Аудиоряд состоит из индивидуальной для каждого испытуемого совокупности переломных автобиографических воспоминаний в вербальной форме, произнесенных собственным голосом, что связано с экологичностью речевой формы по отношению к оперантам сознания. Аудиозаписи воспоминаний предъявляются параллельно («хор»). Видеоряд состоит из серии фотоизображений, каждое из которых является визуальным референтом одного из воспоминаний. Изображения обработаны таким образом, что смысловой пунктом композиции выделен как фигура, а фон ослаблен и размыт (Nourkova, 2003). Серия предъявляется циклическим образом на протяжении всего времени звучания аудиозаписи со скоростью мелькания 60 мс., что обеспечивает доступ к соответствующим содержаниям без их полного осознания. На тренировочном этапе испытуемого информируют о задаче воздействия, знакомят с существующими в культуре моделями описания данного мнемического феномена. Затем предоставляется возможность отдельного прослушивания и просмотра аудио- и видеоряда до тех пор, пока испытуемый не достигнет различения каждого из элементов стимула (этап овладения средством). На основном этапе испытуемому предъявляется целостный стимул, затем, после двухминутной паузы собираются данные самоотчета. В качестве контрольного условия нами используется созданный по аналогичному алгоритму стимул, где испытуемый слышит «хор» чужих воспоминаний, звучащих голосом экспериментатора, и видит последовательность чужих фотоизображений.

Полученные данные позволяют утверждать, что после восприятия стимула, информированный испытуемый способен сформировать целостный («голографический») образ, интегрирующий содержание сообщений, что создает яркую иллюзию «оживания» всей истории жизни с эффектами субъективного растяжения времени, внутренней мобилизации и ценностного переживания самотождественности. В контрольных условиях сходных явлений не наблюдается.

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ПОЛ КАК ПРЕДИКТОР АССОЦИАЦИИ ПОЛИМОРФИЗМА ГЕНА ТРАНСПОРТЕРА СЕРОТОНИНА И ПРОЦЕССОВ ВНИМАНИЯ

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Медиатор головного мозга серотонин (5-НТ) участвует в регуляции различных видов поведения. Нарушения в передаче 5-НТ увеличивают риск суицидального поведения (Arango et al., 2003), депрессии (Lesch, 2004), повышенной агрессии (Порова, 2006), а также влияют на память и когнитивные функции (Meneses et al., 1995; Williams et al., 2002). Белок – переносчик серотонина, кодирующийся геном *SLC6A4*, играет важную роль в регуляции пространственной и временной функции 5-НТ синапса (Lesch, 1997). В гене *SLC6A4* человека (17q11.2–12) выявлен полиморфный сайт *5HTTLPR*, включающий 16 (L) или 14 (S) повторяющихся блоков из 22 пар оснований (Murphy et al., 2004). Гомозиготы по S аллелю характеризуются сниженной экспрессией мРНК, плотностью белка транспортера и скоростью инактивации медиатора (Lesch et al., 1996). Недавно была выявлена повышенная вербальная и образная креативность у людей, гомозиготных по S аллелю (Volf et al., 2009).

В соответствии с представлениями об иерархической организации информационных процессов креативность связывают, в частности, с такими функциями более низкого уровня, как внимание и память (Dietrich, 2004). Эти функции поддаются гораздо более четкому, чем креативность, определению и, соответственно, более адекватной диагностике, что делает их более удобным объектом психогенетического изучения и обеспечивает приближение к пониманию генетических основ иерархически более сложных ментальных функций (Равич-Щербо и др., 2000). В настоящее время показано, что более высокая креативность связана с ослаблением селективных процессов в правом полушарии (Вольф и др. 2007). Также обнаружена связь высокой креативности с ослаблением выраженности ориентировочной реакции (Онищенко и др., 2009). Следует отметить, что выявленные

связи между креативностью, с одной стороны и ориентировочной реакцией – с другой, были характерны только для мужчин и отсутствовали у женщин (Вольф и др. 2007; Онищенко и др., 2009), что свидетельствует о необходимости учета половых различий при анализе ассоциаций между генотипом и вниманием. Однако такие исследования в отношении полиморфизма *5-HTTLPR* не проводились.

Целью данной работы является исследовать ассоциацию между полиморфизмами гена транспортера серотонина и вниманием с учетом половых различий. В сформированные группы входили 110 человек, этнически русских. Образцы ДНК выделяли из букальных соскобов эпителия ротовой полости солевым методом. Генотип определяли с помощью ПЦР с последующим электрофорезом продуктов в 3% агарозном геле. Распределение полиморфизма генотипов *5HTTLPR* в группе соответствовало закону Харди-Вайнберга. Непроизвольное внимание – ориентировочная реакция, связанная с новизной предъявляющегося стимула. Для ее изучения была использована разработанная нами модификация odd-ball задачи с латерализованным предъявлением стимулов в компьютеризированном эксперименте. Для исследования трех систем внимания, таких, как бдительность, ориентация и исполнительный контроль, в основе которых лежит нейросетевое объединение различных анатомических структур, использовали Attention network test (ANT). Статистическую обработку проводили с использованием *ANOVA*.

Были показаны достоверные половые различия в латеральности ориентировочной реакции для женщин – носителей S аллеля и мужчин – носителей L аллеля. Ориентировочная реакция более выражена при предъявлении стимулов в левое поле зрения (что соответствует их адресации правому полушарию мозга) по сравнению с предъявлением в правое поле зрения (левое полушарие).

При исследовании трех систем внимания достоверные половые различия были показаны

для системы пространственной ориентации. Среди носителей S аллеля мужчины обладали лучшими показателями эффективности системы ориентационного внимания по сравнению с женщинами, в то время как среди гомозигот по L аллелю такими показателями обладали женщины. Кроме того, среди женщин гомозиготы по L аллелю обладали более выраженной пространственной селекцией входящей информации.

Полученный нами факт половых различий во взаимосвязях между полиморфизмом *5HTTLPR* и проявлением ориентировочной реакции и пространственным вниманием согласуются с данными, полученными в экспериментах на животных, которые также показали отчетливые половые различия выраженности этих реакций и у особей с ранними постнатальными воздействиями на серотониновую систему мозга (Hohmann et al., 2007).

Таким образом, наше исследование показывает необходимость учета фактора пола при анализе взаимосвязей между генотипом и поведением.

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ИССЛЕДОВАНИЯ КОГНИТИВНЫХ СПОСОБНОСТЕЙ ПТИЦ В ЕСТЕСТВЕННОЙ СРЕДЕ ОБИТАНИЯ

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Исследования когнитивных способностей животных (в том числе птиц) проводят преимущественно в условиях лабораторного эксперимента. Исключение составляют немногочисленные работы на приматах (Фирсов, 1972, 1974) и птицах: колибри (Henderson, Hurly, Healy, 2001, 2006; Gonzalez-Gomez, Vasquez, 2005), синицах (Morand-Ferron, Quinn, 2011; Feeney, Roberts, Sherry, 2009) и мухоловках (Дерим – Оглу, Егорова, 1982). Однако данные, полученные в ходе полевых исследований, несомненно, дополняют и расширяют наши представления об особенностях поведения и о когнитивных способностях исследуемых видов.

Нами был разработан и апробирован экспериментальный подход, предназначенный для сравнительных исследований когнитивных способностей птиц в их естественной среде обитания с применением стандартных лабораторных методов. В качестве объекта исследования была использована серокрылая чайка (*Larus glaucescens*). Данных о когнитивных способностях чаек, а также о структурно-функциональной организации их мозга нам обнаружить не удалось. Известно лишь, что значение полушарного индекса Портмана у них составляет 4.93 (Portmann, 1947), что позволяет относить их скорее к птицам с примитивно организованным мозгом (таким, как голубиные и куриные). В природе серокрылым чайкам свойственно пластичное поведение, которое позволяет им быстро приспосабливаться к изменяющимся условиям окружающей среды и использовать

в пищу практически любые доступные корма (зеленская, 2008).

Территориальность этого вида в период размножения и тот факт, что чайки, обитающие на заповедной территории (ГПБЗ «Командорский»), практически не боялись человека, позволили нам работать с индивидуально узнаваемыми особями непосредственно на их гнездовых участках внутри колонии. На 35 чайках показана возможность использования данного подхода для комплексного исследования их когнитивных способностей: способность к обобщению по относительным признакам «больше» и «меньше» при выборе объемных фигур разного размера из пары («relational learning»), наличие представления о «неисчезаемости» предметов («object permanence»), способность к экстраполяции направления движения пищевого раздражителя, исчезающего из поля зрения за непрозрачной преградой.

Восемь птиц успешно обучились выбору большего, другие 8 – меньшего предмета (группы «большее» и «меньшее») с использованием двух пар предметов. В тестах на перенос предъявляли новые комбинации предметов, использованных при обучении. В первом тесте предъявляли две пары предметов, имевших одинаковое сигнальное значение при начальном обучении (оба подкреплялись или оба не подкреплялись). Достоверное большинство птиц успешно решило этот тест. Значит, они не только запомнили два конкретных подкрепляемых предмета, но и обобщили информацию об их относительных размерах. Во втором тесте птицам предъявляли две новые пары предметов, ранее имевших разное сигнальное значение (один подкреплялся, другой – нет). Птицы всегда предпочитали выбирать ранее подкрепляемый предмет, и когда это было верным решением, и когда это было неверным решением теста. По-видимому, выработки всего двух дифференцировок стимулов разного размера оказалось недостаточным, чтобы сформировать обобщенное правило выбора по относительным признакам «больше» и «меньше».

Чтобы проверить это предположение, у двух новых групп птиц мы последовательно вырабатывали четыре дифференцировки предметов разного размера. Три птицы успешно обучились выбору большего, другие три – меньшего предмета. В тестах на перенос предъявляли новые комбинации предметов, использованных при обучении; затем предметы нового цвета и формы; а затем стимулы новой категории – множества. В заключительной серии, когда чайкам предъявляли пары, составленные из предметов,

ранее имевших одинаковое или разное сигнальное значение, большинство птиц из обеих групп решали тест правильно. Следовательно, после обучения чаек на четырех парах предметов информация о подкреплении и конкретных подкрепляемых стимулах остается не столь значимой, как после обучения на двух парах предметов.

Для оценки степени обобщенности правила выбора, предъявляли предметы нового цвета. Все птицы из группы «меньшее» и только 1 птица из группы «большее» справились с выбором. При предъявлении предметов новой формы и цвета, все птицы из группы «меньшее» и только одна птица из группы «большее» успешно решили этот тест. Существенно отметить, что ни одна птица не справилась с тестом, где для выбора предъявили стимулы новой категории – множества, составленные из разного числа (от 2 до 5) мелких кубиков разного цвета. Результаты этих тестов позволяют заключить, что в отличие от птиц сем. *Corvidae*, чайки, так же как и другие виды с относительно примитивно организованным мозгом (например, голуби), способны перенести правило выбора по относительным признакам «больше/меньше» только на стимулы той же категории, незначительно отличающиеся от использованных при обучении.

Подобное сходство с голубями было обнаружено и в результате применения других когнитивных тестов. Даже наиболее простой из них – тест на «неисчезаемость» приманки, на глазах птицы спрятанной под непрозрачный цилиндр, решили лишь две чайки из 12, т.е. не справились с ним подобно голубям. Тест на экстраполяцию направления движения приманки, исчезающей из поля зрения, решили 2 птицы из 8, т.е., как и голуби, чайки обходили преграду чисто случайным образом. Таким образом, проведенный комплекс экспериментов показывает, что когнитивные способности чаек скорее сравнимы с когнитивными способностями голубей – птиц с относительно примитивным мозгом, чем с такими высокоорганизованными птицами, как врановые, которые обладают крупным и тонко дифференцированным мозгом и способностью к формированию довербальных понятий и к решению ряда других сложных когнитивных задач (Зорина, Обозова, 2011).

Благодаря тому, что опыты проводили в природе, мы имели возможность наблюдать естественное поведение чаек в колонии и заметили, что работа с конкретной парой птиц не оставляет равнодушными их соседей по гнездовым территориям, которые находились на соседних участках и, возможно, наблюдали за тем, что там происходит. Это наблюдение позволило нам

подойти к проблеме исследования способности птиц к обучению путем наблюдения за действиями своих сородичей в природе, в естественной для них среде обитания. Для того, проверить, как они используют получаемую при этом информацию, мы обучали чаек, выполняющих роль демонстраторов, решению двух задач, не входящих в их видоспецифический поведенческий репертуар. В первой задаче птиц обучали добывать корм, который на виду у них экспериментатор помещал в непрозрачную коробку. Во втором опыте птицы должны были выбирать красный куб из четырех разноцветных. Для овладения этими простыми навыками чайкам

потребовалось от 12 до 41 сочетаний. В отличие от них большинство птиц-наблюдателей, находившихся на соседних гнездовых участках, решали обе эти задачи уже при первом их предъявлении.

Таким образом, чайки способны обучаться решению простых задач путем наблюдения за действиями конспецификов, что может служить одним из способов передачи навыков от одной особи к другой в колонии чаек. Способность к быстрому обучению путем наблюдения может быть одним из факторов, лежащих в основе высоких адаптивных возможностей этих птиц.

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ВЛИЯНИЕ ЭМОЦИОНАЛЬНОГО СОСТОЯНИЯ НА УСПЕШНОСТЬ РАСПОЗНАВАНИЯ ЭМОЦИЙ

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Ключевой вопрос настоящего исследования заключается в том, каким образом эмоциональное состояние наблюдателя влияет на распознавание эмоциональных состояний других людей. На сегодняшний день получены данные о том, что актуальное эмоциональное состояние повышает эффективность переработки эмоциональной информации той же модальности, что и переживаемые человеком эмоции (Niedenthal et al., 2001; Hills et al., 2011). Отмечаются и другие эффекты – например, переоценка соответствующих эмоциональному состоянию человека эмоций, представленных в стимульном материале (Schiffenbauer, 1974). Тем самым текущее эмоциональное состояние человека снижает точность в задаче идентификации эмоций.

Межсубъектный план проведенного экспериментального исследования включал три группы испытуемых. Для приведения участников в эмоциональное состояние, отличное от нейтрального, была проведена специальная процедура индукция эмоций (просмотр короткометражных мультфильмов разной эмоциональной окрашенности). Для контроля изменения эмоций испытуемых использовалась методика Д. В. Люсина, А. Г. Синкевича (Синкевич, 2010), которая позволяет получить самооценку состояния по набору шкал. Таким образом, независимой переменной выступал тип эмоционального состояния (нейтральное, положительно окрашенное,

отрицательно окрашенное); зависимая переменная – количественная оценка двух аспектов распознавания эмоций. 1) Точность – это способность правильно оценить модальность эмоционального состояния другого человека. 2) Сензитивность – это склонность завышать или занижать степень выраженности эмоций различной модальности (Люсин, Овсянникова, 2009).

В соответствии с замыслом исследования сформулированы следующие гипотезы:

1. Точность распознавания эмоций в группе с нейтральным состоянием выше, чем точность в группах с эмоциональным состоянием, отличающимся от нейтрального.

2. Сензитивность в группах с эмоциональным состоянием, отличающимся от нейтрального, выше, чем сензитивность в группе с нейтральным эмоциональным состоянием.

Для выявления успешности распознавания эмоционального состояния другого человека использовался Видеотест Овсянниковой В. В., Люсина Д. В. (Овсянникова, Люсин, 2009). Видеотест состоит из 7 коротких видеосюжетов и 15 шкал для оценки эмоций персонажей сюжетов. Показатель точности отражает степень совпадения профиля оценок испытуемого с профилем «правильных» ответов, полученных при участии группы экспертов. Показатель сензитивности определяется как расстояние между оценками испытуемого и экспертной оценкой.

В качестве дополнительной гипотезы выдвигается предположение о том, что уровень эмоционального интеллекта опосредует связь между валентностью эмоционального состояния

наблюдателя и особенностями распознавания им эмоций другого человека. То есть у людей с высоким и низким уровнем эмоционального интеллекта связи между эмоциональным состоянием и показателями точности и сензитивности различны.

Выборка.

В исследовании приняли участие 69 человек (из них 67% – женского пола) в возрасте от 20 до 54 лет ($M=32.6$, $S=9.3$), представители различных профессий и студенты; 24, 24 и 21 участник в трех группах, соответственно. Группы уравнены по уровню образования, возрасту, полу, уровню эмоционального интеллекта (по результатам выполнения двух субтестов методики MSCEIT (Сергиенко, Ветрова, 2009)).

Результаты и их обсуждение.

Для проверки гипотез о наличии влияния эмоционального состояния на точность и сензитивность распознавания эмоций использовался критерий Краскала – Уоллеса. Не обнаружено значимых различий в точности распознавания эмоций у испытуемых с разным эмоциональным состоянием ($\chi^2 = 1.79$, $p = 0.409$). Однако были получены различия по показателям сензитивности к высокоактивационным состояниям ($\chi^2=19.45$, $p = 0.000$) и сензитивности к эмоциям отрицательной валентности ($\chi^2=8.01$; $p=0.018$). Попарное сравнение значений данных показателей в группах показало, что сензитивность к эмоциям высокой активации выше в «нейтральной» группе по сравнению с группами, эмоциональное состояние которых отличалось от нейтрального ($U=71.0$ для «положительной» и $U=129.0$ для «отрицательной», при $p<0.005$). Похожая тенденция наблюдается для сензитивности к эмоциям отрицательной валентности, но значимые различия получены только для групп с нейтральным и положительно окрашенным эмоциональным состоянием ($U=132.0$, $p<0.006$).

Для проверки гипотезы о том, что связь между состоянием наблюдателя и особенностями распознавания им эмоций другого человека зависит от уровня эмоционального интеллекта, внутри каждой из трех групп испытуемых были выделены подгруппы с разными уровнями этой способности. Критерий Манна-Уитни показал, что испытуемые в отрицательном эмоциональном состоянии с высоким уровнем эмоционального интеллекта (по сравнению с людьми с низким уровнем) при одинаковой

точности распознавания эмоций склонны занижать степень выраженности эмоций другого человека ($U = 8.5$, $p = 0.000$). Для испытуемых других групп статистически значимых различий в распознавании эмоций не обнаружено. Таким образом, в проведенном исследовании данная гипотеза получила частичное подтверждение. Уровень эмоционального интеллекта оказался важным только в случае, когда испытуемые выполняли задание на распознавание эмоций, находясь при этом в отрицательно окрашенном эмоциональном состоянии.

Результаты дают основания предполагать, что влияние состояния человека на распознавание им эмоций может проявляться по-разному в зависимости от валентности и степени активации индуцированных состояний. Так, для испытуемых «нейтральной» группы был получен своеобразный эффект конгруэнтности: они завышали оценки высокоактивационных эмоций, которые в большей степени представлены в их состоянии по сравнению с оценками других групп. В целом полученные результаты согласуются с данными других исследований о том, что характер влияния состояния человека на идентификацию эмоций зависит от его модальности (Hills, Werns <http://www.sciencedirect.com/science/article/pii/S1053810011001735> – aff2, Lewis, 2011).

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МЕТАФОРИЧЕСКОЕ ПЕРЕОСМЫСЛЕНИЕ ЛОКАТИВНОГО ПРЕДЛОГА В

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В когнитивной науке в настоящее время особенно актуальным является изучение восприятия пространства, которое, как отмечает Б. Величковский, характеризуется множественностью (избыточностью) своих операций и специально настроено на функционирование в нормальных условиях жизнедеятельности (см. Величковский 2006: 164). В языке пространственные отношения эксплицируются, в частности, посредством предлогов. В работе А. Вежибицкой (1999: 156) указывается на то, что концепт *внутри*, который семантизируется при помощи соответствующих предлогов, может выступать в роли лексической универсалии.

В когнитивной лингвистике предлоги неоднократно становились предметом пристального внимания исследователей (Lakoff 1987; Langacker 1999; Tyler and Evans 2003 и др.). Однако в украинском языкознании изучение предлогов в когнитивном аспекте до сих пор не проводилось.

Общий реестр предлогов украинского языка довольно велик, если принимать во внимание не только непроеизводные, но и производные предлоги, и насчитывает 256 единиц (Мейзерська 2010: 15). Одним из наиболее частотных в употреблении является предлог *в* (*у, уві*). Семантика этого предлога в украинском языке сильно размыта, как и у всех непроеизводных предлогов. Однако центральным значением конструкций с этим предлогом является локативное, а именно указание на предмет, место, пространство, внутри которого находится другой предмет или внутрь которого направлено действие (ВТССУМ: 71). Украинский предлог *в* (*у, уві*) так же, как и русский предлог *в* (*во*), восходит к древнерусскому *въ, въ (н)* – и праславянскому **въп* (Фасмер 1964: 262). З. Д. Попова отмечает, что, поскольку предлог *в* восходит к лексеме **въп*, имевшей значение *вовнутрь*, образовалась предложно-падежная форма *в + предложный падеж*, обозначающая пространственный локатив, внутри которого что-либо находится или происходит (Попова 2011: 407). Коррелятивный украинский предлог в сочетании с предложным (місцевим) падежом также реализует, в первую очередь, локативные отношения: *в будинку, у вогні*. Метафорическое переосмысление данной

формы для языковой концептуализации временных отрезков (*в минулому, у майбутньому, у той час*), эмоциональных состояний (*у відчаї*), а также социальных состояний (*в жалобі, в затишку, у безпеці*) обусловлено актуализацией элемента значения «внутри». Такие употребления пространственного предлога *в* (*у, уві*) объясняются метафорой контейнер (Лакофф и Джонсон 2004). Поскольку люди неспособны в некоторый момент времени охватить (увидеть) мир в целом, а видят только его части, мы помещаем видимое в рамки, очерчиваем границы предметов и явлений окружающего мира, сосредотачивая внимание на некотором (конкретном) пространстве: «Мы концептуализируем поле зрения как вместилище, а то, что видим, – как содержимое внутри его» (Лакофф и Джонсон 2004: 55). Таким образом, в некое очерченное пространство может быть помещен иной предмет.

Важной особенностью восприятия пространства является, в частности, бинокулярное восприятие глубины, обусловленное физиологическими факторами (подробнее см. Величковский 2006: 165). Именно этим свойством восприятия обусловлено, по-видимому, то, что во многих предложных конструкциях с *в* (*у, уві*) не просто сохраняется значение некоего ограниченного пространства, но и развивается значение глубины, на что указывает способность данного предлога сочетаться с лексемами, обозначающими глубину. Представляется, что именно концепт глубины является основным в метафорическом развитии значений этих конструкций. Рассмотрим некоторые примеры, начиная с сочетаний, выражающих локативные отношения: *у морі (глибоке море); у криниці (глибока/бездонна криниця); у (глибокій) долині; у (глибокій) норі; у тарілці (мілка/глибока тарілка)*. В этих примерах наличествуют пространства, для которых глубина является естественным признаком, в других примерах глубина метафорическая: *у глибині очей (у глибоких/бездонних очах; її очі – бездоння); у космосі (бездонний космос)*. Темпоральные значения также могут быть «глубокими»: *в ту ніч (глибока ніч), у глибоку давнину, у глибині століть*. Так, и некоторые события, действия или занятия воспринимаются как имеющие не только горизонтальные границы, но и вертикальные (глубину): *заглибитись у роботу, заглибитись у справу, погрузнути з головою у проблемах, поринути у спогади*. Продуктивные метафоры глубины

прослеживаются в концептах состояний, поскольку все состояния воспринимаются как контейнер или текучее вещество (для которого тоже требуется контейнер): *уві сні (глибокий сон); у глибокому відчай; в очах, повних відчаю* (здесь, согласно идее, выраженной в работе Лакофф и Джонсон 2004, *відчай* «отчаяние» является ВЕЩЕСТВОМ во ВМЕСТИЛИЩЕ – в очах «глазах», а в предыдущем примере *відчай* – ВМЕСТИЛИЩЕ, в котором находится человек); *у горі (глибоке горе)*. «Вместилища», которые человек не может увидеть или ощутить физически, всё равно в языке приобретают конкретные формы, которые можно заполнить: *у серці, в душі (серце, сповнене радості; на дні серця/душі); у голосі помітний/відчувається холод*.

Исследование украинского предлога *в* проводится в сопоставлении с коррелятивными предлогами сербского и английского языков на материале произведений М. Павича и их переводов. Подобная метафорическая связь прослеживается и в сербском, и в английском языках, концептуализируясь в предлогах *у* и *in*. Отмеченное явление служит подтверждением того факта, что концепт «глубина» является одним из базовых в метафорическом развитии значений предлога *у* (*в*) и его коррелятов в других языках.

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СРАВНЕНИЕ ОБЪЕМА РАБОЧЕЙ ПАМЯТИ У НОВИЧКОВ И ПРОФЕССИОНАЛОВ В СФЕРЕ ЛИНГВИСТИКИ

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Данное исследование преследует несколько целей: 1) разработка русскоязычного теста на измерение объема вербального компонента рабочей памяти, разработанного на основе англоязычного теста *reading span*, предложенного Данеман и Карпентер (1980); 2) сравнение с помощью нового теста объема рабочей памяти у профессионалов и новичков в сфере лингвистики, а также сравнение полученных показателей с результатами «нелингвистов».

В данном исследовании были взяты три типа стимулов: профессиональная лексика, т.е. слова, которые активно используются лингвистами; омонимы, т.е. слова, которые по содержанию являются лингвистическими терминами, однако имеют второе значение в обычной лексике, т.е. эти слова можно расценивать и как лингвистический термин, и как слово, относящееся к общей

лексике (например, слово «экскурсия» может быть определено и как коллективное посещение достопримечательного места с научной, образовательной или увеселительной целью, и как начальная фаза артикуляции звука, представляющая собой переход от нейтрального положения органов к выдержке) и повседневная лексика, т.е. слова, которые активно используются всеми.

В исследовании приняли участие 19 «экспертов», имеющих оконченное высшее образование в области лингвистики и работающих в данной области, а также студентов-лингвистов 5 курса и аспирантов лингвистических специальностей МГУ и РГГУ; 23 «новичка», студенты-лингвисты 2–4 курсов из МГУ и РГГУ; а также 22 «нелингвиста», людей, не имеющих отношение к лингвистике, с высшим или неоконченным высшим образованием разных направлений.

В качестве стимульного материала был использован адаптированный тест *reading span*, состоящий из трех частей – 100 предложений (5 групп по 2, 3, 4, 5 и 6 предложений) со словами, относящимися к лингвистике (пример «В парсии

и талышском только слово «бог» не подвергается *роtaцизму*), 100 предложений с омонимами, то есть лингвистическими терминами, имеющими омонимы в повседневной лексике (пример – «Слово с ударением не на последнем слоге называется *баритоном*») и 100 предложений с общей лексикой (пример – «Полотно Малевича стояло под покрывалом, пока шел *аукцион*»).

Испытуемым на экране поочередно предъявлялись предложения, которые они должны были читать вслух, при появлении пустого экрана, испытуемые называли последнее слово из каждого предложения. Предъявление предложений заканчивалось, когда испытуемый не мог назвать целиком слова ни из одной группы.

Были получены следующие результаты: 1) Сравнение эффективности запоминания тремя группами испытуемых трех типов лексик (профессиональная лингвистическая лексика, слова-омонимы, имеющие лингвистическое и общежитейское значение, житейская лексика) показало значимое влияние на успешность запоминания фактора группы ($F(2,3029) = 211,588$, $p < 0,0001$), фактора материала ($F(2,3029) = 45,562$, $p < 0,0001$) и взаимодействие названных факторов между собой $F(4,3029) = 45,562$, $p < 0,0001$). См. рис. 1.

2) Затем с помощью однофакторного дисперсионного анализа мы сравнили эффективность запоминания трех названных видов лексик в рамках каждой из экспериментальных групп. Во всех случаях мы выявили значимые различия:

Для группы экспертов ($F(2,1069) = 8,012$, $p < 0,0001$). Дополнительная проверка с помощью

апостериорных тестов продемонстрировала, что значимыми оказались различия между успешностью выполнения первого (профессиональные термины) и третьего (общая лексика) субтестов (множественные сравнения по методу Т2 Тамхейна, $p = 0,001$), первого и второго (омонимы) субтестов (множественные сравнения по методу Т2 Тамхейна, $p = 0,005$); между вторым и третьим субтестом значимых различий выявлено не было.

Для группы новичков ($F(2,1094) = 3,295$, $p = 0,037$). Дополнительная проверка с помощью апостериорных тестов продемонстрировала, что значимыми оказались различия только между первым и третьим субтестами (множественные сравнения по методу Т2 Тамхейна, $p = 0,045$). Для группы «нелингвистов» ($F(2,864) = 69,627$, $p = 0,0001$). Значимые различия были выявлены между всеми тремя субтестами (везде множественные сравнения по методу Т2 Тамхейна, $p = 0,001$).

Таким образом, мы можем заключить, что между успешностью запоминания стимулов лингвистами-новичками, лингвистами-экспертами и «нелингвистами» существуют различия, а именно, «нелингвисты» успешнее всего запоминают общую лексику, хуже всего – лингвистические термины; лингвисты-эксперты лучше всего запоминают омонимы и общую лексику, чем термины; лингвисты-новички успешнее в запоминании общей лексики, чем терминов. Также мы можем сказать, что на успешность запоминания тех или иных стимулов влияют не только их модальность и размер, но и контекст и понятность стимулов.

Также результаты исследования представляется сложным объяснить с точки зрения модели Бэддели, так как непонятно, с чем связано возрастание успешности запоминания при увеличении экспертности, и почему кривые запоминания с повышением экспертности выравниваются.

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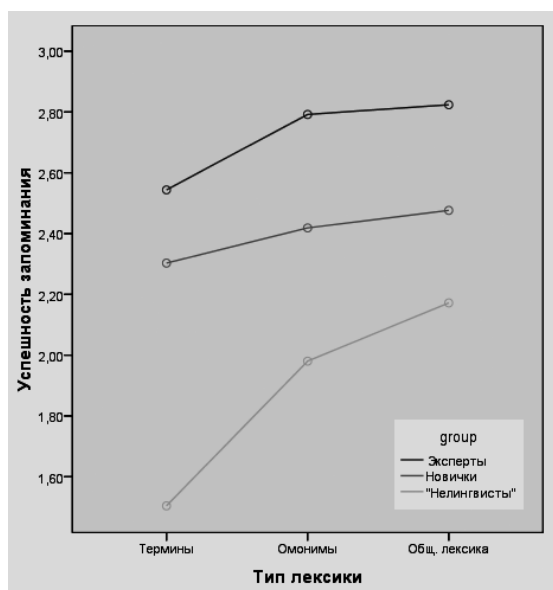


Рисунок 1. Кривая запоминания различными группами испытуемых.

СТРУКТУРА И ФУНКЦИИ КОГНИТИВНЫХ ПРИВЫЧЕК В ПОВСЕДНЕВНОЙ ИНТЕЛЛЕКТУАЛЬНОЙ ПРАКТИКЕ

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Интеллектуальная работа, как и любая другая, требует энергозатрат и определенного уровня развития навыков, необходимых для ее исполнения. В физике считается, что полноценному переводу энергии в работу препятствуют сопротивление среды, в которой осуществляются действия, а также их разнонаправленность по отношению к основной цели. В общем виде можно считать это верным и для интеллектуальной работы.

Изучение когнитивной деятельности в лабораторных, экспериментальных условиях обладает рядом неоспоримых преимуществ. Однако лабораторные ситуации создаются искусственно и, по необходимости, вырваны из контекста повседневной практики человека. Это не позволяет сделать предметом изучения многие аспекты привычного для данной личности интеллектуального поведения, которые существенно влияют на субъективную цену ее когнитивных усилий и качество произведенного ею интеллектуального продукта.

Исходя из вышеназванных посылок, субъектом исследования были выбраны когнитивные привычки личности. Определим их как устойчивые, самовоспроизводящиеся способы интеллектуальной работы личности, которые выполняют регуляторные функции. Когнитивные привычки являются одним из важных продуктов социализации личности. Они формируются отчасти стихийно, отчасти целенаправленно. У молодого взрослого человека обычно сформирована целая система когнитивных привычек, управляющих ходом его умственной работы. Как предмет изучения когнитивные привычки интересны тем, что, с одной стороны, сквозь них «видны» некоторые важные интрапсихические процессы, а с другой стороны, в них отражаются события личностной истории обладателя привычек.

Предметом нашего эмпирического исследования (проведенного совместно с А. Ю. Жуковой) были когнитивные привычки успешных студентов, управляющие такими видами интеллектуальной работы, как слушание и запись лекций, чтение и конспектирование книг, выполнение домашних заданий, подготовка к экзаменам. Исследование проводилось в два этапа.

На первом этапе при работе с 15 добровольцами был использован метод индивидуального глубинного полуструктурированного интервью. С каждым оно длилось несколько часов в течение 2–3 встреч. Интервью записывалось на диктофон и затем расшифровывалось. В результате было собрано более 600 индивидуальных когнитивных привычек, относившихся к разным уровням и этапам интеллектуальной работы. Далее они анализировались в соответствии с определенным планом и классифицировались. Задачей этого этапа было максимально подробное и полное описание работы индивидуальной «психической кухни», где создавались продукты когнитивной деятельности. На основе этого материала был сделан вопросник из 70 вопросов.

На втором этапе этот вопросник был использован для электронного опроса 114 успешных студентов разных вузов Санкт-Петербурга, которые были предварительно отобраны и согласились принять участие в опросе. Задачей этого этапа работы было выяснение частоты встречаемости отдельных видов когнитивных привычек в поведенческом репертуаре студентов.

Опишем наиболее важные результаты данного исследования.

1. Когнитивная привычка обычно состоит из трех структурных компонентов: 1) ценностной основы, представленной базовым утверждением (например, «жизнь коротка и все надо делать сразу и до конца»); 2) устойчивой программы действий; 3) ситуативного триггера, запускающего развертывание этой программы.

2. Когнитивные привычки управляют действиями на разных уровнях организации интеллектуальной работы. В частности, они регулируют как создание внешней ситуации, так и психофизиологического состояния, привычных для осуществления когнитивной деятельности; темп и этапы интеллектуальной работы, критерии ее завершения и оценки ее результата; поддержание привычного самоотношения и сложившихся отношений с окружающими.

3. Когнитивные привычки являются показателем отношения личности к себе как к субъекту когнитивной деятельности, к интеллектуальной работе как таковой и к решаемой задаче, а также они являются важным индикатором сформированности системы метакогнитивной регуляции субъекта.

Работа выполнена в рамках НИР, финансируемой за счет средств федерального бюджета, «Информационно-энергетические аспекты когнитивной деятельности» (838.191.2011).

ЖЕСТОВАЯ КОДИРОВКА ЦЕНТРАЛЬНОСТИ РЕФЕРЕНТА В ДИСКУРСЕ (НА МАТЕРИАЛЕ ПОСЛЕДОВАТЕЛЬНЫХ ПЕРЕСКАЗОВ «РАССКАЗОВ О ГРУШАХ» У. ЧЕЙФА)

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Данная работа является результатом анализа русской разговорной речи в когнитивной перспективе. Многие лингвистические проблемы требуют рассмотрения не только со стороны лингвистики, но и со стороны смежных наук. Так, толчком к данному исследованию послужила работа английского психолога Ф. Бартлетта, предложившего идею последовательного пересказа с целью исследования памяти (Bartlett 1932). Ученый показал, что процесс вспоминания является реконструкцией, а не точным повторением услышанного. Позднее идея пересказа стала основой труда «Рассказы о грушах» под редакцией У. Чейфа (Chafe 1980). Для проведения исследования было решено снять свой фильм, в котором будут присутствовать последовательные и одновременные действия, тривиальные и яркие эпизоды, различные действующие лица. Этот фильм должен был быть приемлемым для представителей разных культур. Именно этот фильм был использован при проведении данной работы.

Исследование выполнено в рамках мультимодального подхода к лингвистике, подразумевающего рассмотрение не только вербальной составляющей речи, но и просодической, и визуальной. По одному из исследований, по визуальному каналу (если его изолировать от других) слушающий получает 33% информации (Кибрик 2009).

В данной работе речь идет о дискурсивном понятии протагонизма – степени центральности референта для дискурса. Задача данной работы заключается в том, чтобы рассмотреть, возможно ли сохранение протагонизма при пересказе. Рассматривается это на жестовом уровне, принадлежащем к визуальному каналу передачи информации. Учитывались только изобразительные жесты, т.к. они являются наиболее частотными (Николаева 2005).

Были проделаны следующие этапы работы:

1. Испытуемый смотрит фильм о грушах и пересказывает его собеседнику, это записывается на видеоаппаратуру.

2. Из 20 записей таких пересказов выбирается три **первичных пересказа** (на этом этапе рассматривается только вербальный уровень):

- Запись с протагонистом-мальчиком
- Запись с протагонистом-фермером
- Запись, в которой явного протагониста нет.

3. Эти три видеозаписи **первичных пересказов** показываются 24 испытуемым (по 8 человек в каждой группе), в итоге получается 24 **вторичных пересказа**.

4. Сравнивается количество изобразительных жестов в первичных и вторичных пересказах.

В результате выяснилось, что во вторичных пересказах количество изобразительных жестов значительно уменьшилось. Несмотря на это, жесты помогают говорящему поддерживать роль протагониста следующим образом. Ситуация, когда мальчик – протагонист, является наиболее естественной, потому что именно он совершает большее количество действий. Поэтому во второй производной меньше всего жестов используется при пересказах с протагонистом-мальчиком, больше всего – с фермером. Кроме того, в целом количество жестов увеличивается, если в первичном пересказе имеется два главных героя. Говорящий стремится к тому, чтобы главный герой в его дискурсе был.

Исследование показало, что необходимо рассматривать взаимодействие разных уровней передачи информации от говорящего к слушающему, поскольку коммуникация не основывается исключительно на речи.

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БИОУПРАВЛЕНИЕ ПРИ КОРРЕКЦИИ ЗАИКАНИЯ

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Заикание – сложное психофизиологическое нарушение речи, в основе которого лежит взаимодействие генетических предпосылок индивида и специфических факторов окружающей его физической и социальной среды. Процент пораженных этим нарушением в различных популяциях варьирует от 1% до 5%. Разработкой теоретических подходов и практических методик лечения заикания занимались психиатры, психологи, лингвисты, биомеханики и логопеды. Разнообразие подходов и моделей заикания свидетельствует о сложной структуре процесса порождения и управления речью, в который вовлечены многочисленные мозговые структуры и психофизиологические функции. Выявление механизмов заикания и разработка эффективных методов его лечения является одной из сложнейших и актуальнейших проблем современной коррекционной психофизиологии, психологии и медицины. Одним из возможных подходов к решению этой проблемы является теория функциональных систем (ФС) П. К. Анохина. С позиций теории ФС заикание можно рассматривать как одну из неадекватно сформированных систем, реализующих речевую функцию. Это нарушение возникает как результат неадекватных отношений «организм-среда», которые вызывают патологии подсистем организма, участвующих в контроле отдельных реакций или целостного речевого паттерна. Ведущую роль при формировании любой ФС играют обратные связи, которые способствуют системной организации, включенные в данную систему морфологических структур. Учитывая эту роль обратных связей при формировании как адаптивных так и дезадаптивных ФС, наиболее перспективным методом коррекции заикания как патологического состояния ФС является метод с использованием биоуправления (БУ).

В исследовании по применению БУ при лечении заикания приняли участие 4

человека с различными по тяжести нарушениями. Структура исследования состояла из диагностической процедуры, тренинговых сессий, мониторинга и анализа изменений, происходящих в процессе коррекционного цикла. Тренинги по коррекции состояли из трех этапов. На первом этапе проходило обучение контролю своего функционального состояния по показателям вегетативной НС – электрокардиограмме, кожно-гальванической реакции, электромиограмме (ЭМГ), дыханию и фотоплетизмограмме. На втором этапе, контролируя свое функциональное состояние по одному, наиболее информативному для него показателю, испытуемый читал вслух слова и словосочетания, которые обычно вызывали трудности при произношении. На третьем этапе он воспроизводил по памяти состояние релаксации (без обратной связи) и произносил тестовые слова и словосочетания, опираясь на показатели ЭМГ, регистрируемые от его гортани. В процессе коррекционной процедуры систематически, через каждые 5 тренингов, проводилась одновременная регистрация 21-канальной электроэнцефалограммы (ЭЭГ) и перечисленных выше параметров вегетативной НС.

Результаты исследования показали, что:

а) речевой процесс сопровождается изменением большинства параметров ФС, о чем свидетельствует специфическая динамика спектральных составляющих ЭЭГ

б) в процессе тренинга наряду с улучшением произнесения тестовых словосочетаний и положительной субъективной оценкой своей речи, происходят изменения контролируемых в тренингах параметров.

в) в ходе тренинговых занятий в зависимости от их количества и интенсивности значительно менялась структура и система взаимосвязей между различными областями мозга, что отражалось в соответствующей динамике паттернов кросскорреляций спектров различных частотных диапазонов.

ОСОБЕННОСТИ ФОРМИРОВАНИЯ БЛИЖНИХ И ДАЛЬНИХ СВЯЗЕЙ ЭЭГ ОТРАЖАЮТ РАЗЛИЧИЯ В ГЕНЕТИЧЕСКИХ И СРЕДОВЫХ ВЛИЯНИЯХ НА СТАНОВЛЕНИЕ В ОНТОГЕНЕЗЕ СИСТЕМНОЙ ДЕЯТЕЛЬНОСТИ МОЗГА ЧЕЛОВЕКА

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Гипотеза В. Брайтенберга (Braitenberg, 1978) о различном функциональном предназначении длинных и коротких волоконных систем коры оказала влияние на изучение нейрофизиологических механизмов системной организации деятельности мозга. Так, в работах Поля Нуньеза (Nunez, 1989, 1995) было сформулировано положение «global versus local» о различной роли глобальных и локальных взаимосвязей кортикальных полей в генерации биоэлектрической активности мозга. В исследованиях, проведённых с использованием близнецового метода (Van Baal et al., 1998; Tsitseroshin et al., 2003; Ivonin et al., 2004), были получены данные о высокой генетической обусловленности становления длинных межкортикальных связей в отличие от коротких, развитие которых, по мнению этих авторов, в большей степени зависит от влияния внешней среды.

В настоящей работе был проведен анализ степени межиндивидуального сходства пространственной организации ЭЭГ у различных индивидуумов в группах взрослых испытуемых ($n=39$), детей 8–9 ($n=21$) и 5–6 лет ($n=26$) и новорождённых ($n=19$). Коэффициенты межиндивидуального сходства вычисляли по алгоритму кросскорреляции Пирсона в парах индивидуумов между присущими им паттернами пространственной организации дистантных связей ЭЭГ, как в целом от 20-ти монополярных отведений, так и в разных комбинациях связей ЭЭГ.

Результаты исследования показали наличие высокого уровня межиндивидуального сходства пространственной структуры дистантных связей биопотенциалов мозга, который у взрослых и у детей 5–6 и 8–9 лет превышал значения 0.80 почти для всех комбинаций связей ЭЭГ, а у новорождённых достигал 0.60. При этом максимальными значениями коэффициентов межиндивидуального сходства (более 0.90) как у взрослых, так и у детей 5–6 и 8–9 лет, отличались пространственные структуры межполушарных взаимосвязей билатерально-симме-

тричных областей левого и правого полушарий. Уровень 0.80 превышали также и значения коэффициентов сходства между индивидуумами для комбинаций внутриполушарных связей ЭЭГ, оцениваемых в пределах каждого из полушарий. Даже у новорождённых детей коэффициенты сходства этих комбинаций дальних связей ЭЭГ, т.е. меж- и внутриполушарных, были наибольшими среди коэффициентов сходства для всех других комбинаций, превышая уровень 0.70.

Особым характером формирования в онтогенезе отличалась пространственная структура статистических связей между биопотенциалами близлежащих зон коры обоих полушарий. Во всех возрастных группах эта комбинация отличалась наименьшими значениями коэффициентов сходства, отражая более высокую, чем в других комбинациях связей ЭЭГ, межиндивидуальную вариабельность опосредуемых ею дистантных взаимодействий потенциалов коры. Даже у взрослых испытуемых именно этой комбинации соответствовали наиболее низкие значения коэффициентов межиндивидуального сходства, особенно в группе мужчин – 0.43. Эти данные согласуются с полученными в работах (Van Baal et al., 1998; Tsitseroshin et al., 2003; Ivonin et al., 2004) результатами, которые позволили сделать вывод о том, что становление именно ближних межкортикальных взаимосвязей биопотенциалов головного мозга человека (по сравнению с другими волоконными путями коры) в наименьшей мере зависит от генотипа и в наибольшей степени обусловлено влияниями внешней среды. Согласно мнению М.Н. Цицерошина и А.Н. Шеповальникова (1997, 2009), повышенная пластичность «ближних связей» распределённых отделов неокортекса может играть одну из важнейших ролей в обеспечении высокой способности мозга к адаптации и обучению. Согласно полученным нами данным, начиная с возраста 5–6 лет, наблюдается значительное понижение межиндивидуального сходства пространственной организации потенциалов мозга, опосредуемых через ближние межкортикальные взаимосвязи. Это может свидетельствовать о накоплении с возрастом у разных индивидуумов в популяции индивидуальных особенностей в морфофункциональном обеспечении ближних межрегиональных взаимодействий в коре за счёт разнообразия воздействующих

на разных индивидуумах средовых факторов. Такое обоснование понижения степени межиндивидуального сходства паттернов дистантных взаимосвязей ЭЭГ, опосредуемых ближними межкортикальными взаимодействиями, подтверждается также и тем, что коэффициенты межиндивидуального сходства в особой мере снижались с возрастом у лиц мужского пола, что может быть связано с большим разнообразием у мужчин, чем у женщин, накапливаемых в процессе формирования фенотипа индивидуальных свойств и особенностей психофизиологических характеристик ЦНС.

Представленные результаты позволяют полагать, что быстротекущие функционально специфичные взаимодействия, реализуемые через пластичные «локальные цепи», осуществляются на фоне упорядоченной динамической активности коры больших полушарий, относительная устойчивость пространственной структуры которой обеспечивается преимущественно через детерминированные генотипом длинные внутри- и межполушарные «глобальные» взаимосвязи коры, формирующие морфофункциональный «каркас» неокортекса. Такая системная организация межкортикальных взаимодействий при формировании фенотипа может обеспечивать оптимальные условия для эффективной

реализации на разных этапах онтогенеза нервно-психической деятельности индивидуума и осуществления когнитивных функций.

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ВОЗРАСТНЫЕ ИЗМЕНЕНИЯ ПРОСТРАНСТВЕННОЙ СТРУКТУРЫ СУБЪЕКТИВНОГО ЗВУКОВОГО ПРОСТРАНСТВА, ФОРМИРУЮЩЕГОСЯ В УСЛОВИЯХ ДИХОТИЧЕСКОЙ СТИМУЛЯЦИИ СЕРИЯМИ КОРОТКИХ ЗВУКОВЫХ ЩЕЛЧКОВ

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Развиваясь, ребенок активно осваивает окружающий предметный мир, многие объекты которого (живые и неживые) являются источниками различного рода звуков, в результате чего у него формируется зрительно-слуховая модель окружающего пространства. В начале этого процесса ведущую роль играет кожно-кинестетический анализатор, который «обучает» зрительный анализатор буквально «видеть» предметы окружающего мира и их взаиморасположение в пространстве. Слуховой анализатор также участвует в становлении целостного мировосприятия, так как звук является признаком большого количества живых и неживых объектов

окружающей действительности. В результате взаимодействия анализаторных систем звука, которые слышит ребенок, приобретают для него сигнальное значение. Таким образом, у каждого человека формируется модель окружающего пространства, в которой звуковые образы зрительно совмещены со своими источниками или буквально, или на основе памяти «возникает» зрительный образ источника звука.

В исследовании приняло участие 749 человек в возрасте от 2 лет 4 месяцев до 80 лет (Щербаков и др. 2001: 309–315; Паренко и др. 2009: 201–212). Возникающее в процессе дихотического прослушивания серий коротких звуковых щелчков субъективное звуковое поле (СЗП) было очень необычно для слушателей. Все они впервые ощущали неподвижные и движущиеся звуковые образы (ЗО) внутри своей головы. Испытуемым в процессе экспериментов приходилось на основе своего онтогенетического

опыта об окружающем пространстве «осваивать» новое СЗП. Дети, особенно дошкольного возраста, и некоторые взрослые при выполнении локализационных задач (например, отметки начала и окончания движения ЗО) без просьбы со стороны экспериментатора активно использовали руки, отслеживая с их помощью место положения ЗО.

Звук является всего лишь признаком какого-либо объекта окружающего мира, поэтому при дихотической стимуляции зрение, а вслед за ним и осязание как бы восполняли испытуемому недостающую информацию о воспринимаемом ЗО. Особенно такие ознакомительно-поисковые движения были характерны для маленьких детей, у которых на действие дихотического стимула разворачивалась комплексная ориентировочная реакция, призванная не только локализовать звук, но и оценить его значимость (сигнальность). У более взрослых испытуемых вовлечение рук в выполнение заданий наблюдалось крайне редко, двигательное звено у них не выходило на мышцы-исполнители, а было направлено к «энграммам», хранящим информацию о ранее совершенных локализационных движениях. Содружественные движения глаз были отмечены у большинства испытуемых, поэтому отсутствие их при обследовании детей 2–3 лет мы расценивали как подтверждение того, что дети не чувствуют смещение ЗО и его движение.

На основе полученных результатов предлагаем выделить три основных этапа в развитии пространственной структуры СЗП человека.

I этап (формирование СЗП). Процесс формирования СЗП (3–4 год жизни) начинается в его латеральных секторах: при дихотической стимуляции воспринимаются два ЗО, которые локализуются внутри головы слушателя справа и слева на интерауральной прямой. По мере взросления ребенка билатерализованные звуковые образы объединяются в единый ЗО, который характеризуется на этом этапе объемом и неустойчивостью: ЗО может ощущаться равномерно распределенным в правой и левой гемисферах головы или звучать в одной из них; единый ЗО может «расщепляться» на два ЗО, которые затем опять могут объединяться в единый ЗО; в СЗП могут одновременно восприниматься три ЗО – центральный, правый и левый.

На самых ранних стадиях формирования ЗО чувствительность к вводимой от нуля до 1–2 мс интерауральной временной задержке (Δt) с шагом 23 мкс отсутствует, ЗО не латерализуется. Затем отмечается сначала резкое обострение этой чувствительности, что приводит

к «быстрому» расщеплению ЗО ($\Delta t=300\text{--}500$ мкс), которому не предшествует латерализация или движение ЗО. Потом чувствительность к вводимой Δt падает, но зато при ритмичном увеличении Δt возникает новый феномен – ощущение движения ЗО. Первый этап онтогенеза пространственной структуры СЗП захватывает первые 5–6 лет жизни ребенка.

II этап («зрелая» структура СЗП). На втором этапе СЗП приобретает пространственную структуру, характерную для взрослого человека. На этом этапе при $\Delta t=0$ формируется компактный ЗО, который располагается в срединно-сагиттальной плоскости головы, чаще в теменной области. Наблюдается хорошая чувствительность к вводимой Δt , обеспечивающая адекватную латерализацию ЗО и его движение. Полную латерализацию ЗО (90°) можно вызвать только при усилении опережающего сигнала. При наличии одного фактора (Δt) максимальной латерализации ЗО не происходит, и в крайне-латеральных секторах наблюдается «мертвая» зона, в которую ЗО «не заходит». Феномен «расщепления» единого ЗО, при котором каждый щелчок дихотической пары воспринимается по отдельности, возникает при $\Delta t=2\text{--}4$ мс. «Зрелая» пространственная структура СЗП формируется у значительной части детей к 7 годам и сохраняется на протяжении долгих лет (до 60 лет) практически неизменной.

III этап (инволюция пространственной структуры СЗП). В основе инволюции пространственной структуры СЗП лежит постепенное снижение чувствительности мозга к вводимой Δt . При $\Delta t=0$ формирующийся ЗО становится более объемным, чаще локализуется в затылочной области. Уменьшаются угловые размеры зоны движения ЗО и увеличивается «мертвая» зона. Феномен «расщепления» единого ЗО возникает при Δt более 4–5 мс. Появляются испытуемые, нечувствительные к введению даже значительных Δt (30–50 мс). Процесс снижения чувствительности к Δt часто бывает асимметричным, т.е. латерализация и движение ЗО могут быть сохранены лишь с одной стороны СЗП. Увеличивается количество испытуемых со сложной траекторией движения ЗО. Сроки инволюции СЗП подвержены значительным индивидуальным колебаниям, но после 70 лет изменения затрагивают уже всех испытуемых.

При изучении азимутальной локализации ЗО в СЗП идея поиска ответа на два принципиально важных вопроса. Первый: как бинаурально и биполушарно организованная слуховая система (каждая из подсистем которой имеет все возможности для самостоятельного формирования

ЗО) отражает дихотический стимул в виде слитного ЗО, расположенного в пределах СЗП? И второй вопрос. Каким образом, вводимая Δt приводит к градуальной латерализации ЗО в сторону опережающего стимула в дихотической паре? На наш взгляд, ответы на эти вопросы будут способствовать решению задачи, очень лаконично сформулированной И.П. Павловым: «каким образом материя мозга производит субъективное явление», способное изменять течение

материальных физиологических процессов в организме и/или формировать поведение субъекта в окружающей среде.

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НЕСПЕЦИФИЧЕСКОЕ УПРАВЛЕНИЕ СИГНАЛАМИ О РАССОГЛАСОВАНИИ В КОГНИТИВНОЙ СИСТЕМЕ: ВОЗМОЖНАЯ РОЛЬ ЭНДОГЕННЫХ ОПИОИДОВ

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Закономерный переход современной когнитивной науки от традиционной картезианской парадигмы реактивности, со свойственным ей редукционизмом, к активностной концепции (Ю. Александров 2004; Крылов, Ю. Александров 2009) обусловлен, в частности, многочисленными доказательствами опережающего (а не отражающего) способа взаимодействия субъекта с окружающим миром. Этот прогностический механизм, базирующийся на переносе детерминанты текущего поведения (в широком смысле) в будущее время, формируется в нейронных сетях мозга с помощью опережающих связей (feed-forward). Опережающие связи опираются на прогноз динамики событий, а привычные отрицательные обратные связи (feed-back), наоборот, обращены в прошлое и обеспечивают оценку уже свершившегося действия. Таким образом, если в классической схеме с отрицательными обратными связями стимулом к действию является рассогласование между параметрами желаемого и уже полученного результата действия (П. Анохин 1968), то, благодаря прогностическим циклам, создается возможность выбора самой выгодной программы действия с оптимальным соотношением «цены и качества». Ценой в этом контексте являются информационные и энергетические затраты, а качество определяется вероятностью

получения желаемого результата за заданное время.

Поведение, формируемое благодаря этим механизмам, принято считать адаптивным, то есть обеспечивающим сохранение физиологической целостности в изменившихся условиях. Однако хорошо известны ситуации, когда и поведенческий репертуар, и вариативность физиологических функций существенно редуцируются (Фресс, Пиаже 1975). Примером такого рода регрессии является стресс (Парин 2001, 2008; Ю. Александров 2010). Вопреки классическому определению стресса как общего адаптационного синдрома (Selye 1936, 1946), стресс, по крайней мере, на физиологическом уровне, является сугубо антиадаптивным процессом. Эта неспецифическая защитная системная стадийная реакция на прогнозируемое (а не только уже состоявшееся) повреждение является образцом чрезвычайно архаизированного психофизиологического процесса, направленного не на адаптацию к повреждению (достаточно противоестественное, надо признать, предположение), а на противостояние ему. Поэтому в ответ на только ещё прогнозируемое повреждение формируется типовой стереотипный ответ, последовательно затрагивающий и эмоциональную, и вегетативную, и моторную, и когнитивную сферы. Проведённые нами эксперименты и анализ многочисленных литературных данных (Olivero et al. 1986; Судakov 1997; Olson et al. 1998; Omiya et al. 2000; Bodnar, Klein 2006; и мн.др.) указывают на чрезвычайную стандартизацию психофизиологических функций в условиях стресса, что проявляется, в частности, в значительном уменьшении дифференциальной чувствительности по отношению к внешним сенсорным сигналам.

Нейрофизиологам давно и хорошо известны различные системные механизмы, способные обеспечить такое снижения реактивности на обстановочную и пусковую афферентацию (по П. Анохину 1968). Это, например, афферентное реципрокное торможение, эфферентное торможение, формирование эфферентной копии по Хольсту и т.д. (Schmidt, Thews 1987). Мы полагаем, что одной из возможных причин регистрируемого в экспериментах угнетения ответов на стимулы может являться прерывание сигналов о рассогласовании между прогнозируемой и текущей информацией на стадии принятия решения о выборе программы действий – в ситуации уже состоявшегося выбора. В своём предположении мы опираемся на многолетний опыт изучения одной из базовых регуляторных систем организма – эндогенной опиоидной системы (ЭОС).

За ЭОС, открытой в середине 70-х годов прошлого века (Pert, Snyder 1973; Terenius, Wahlström 1973, 1975; Hughes et al. 1975; Teschemacher et al. 1975), прочно утвердилась репутация главной системы «подавления боли» (антиноцицептивной системы) в организме. На бытовом уровне эндорфинам приписывается функция «гормонов счастья». Между тем, роль данного эволюционно древнего нейроэндокринного аппарата существенно глубже (Голанов 1986; Парин 1986, 2001, 2011): это, прежде всего, формирование гипобиотических, минимизирующих энергозатраты, глубоко регрессивных состояний. В ряду таких состояний и гибернация (истинная зимняя или летняя спячка животных), и летаргия, и стресс (особенно на его завершающей стадии – истощения), и шок. Велик вклад ЭОС в формирование зависимостей (прежде всего, наркотической), функционирование «центров удовольствия» (Olds, Milner 1954; Kringelbach 2009), и т.д.

Какие же существуют основания для характеристики ЭОС как эффективного прерывателя сигналов о рассогласовании на стадии принятия решения?

— Во-первых, нейроморфологические факты (Bloom et al. 1978; Vaccarino, Kastin 2000, 2001; Narita et al. 2006): нейроны, продуцирующие опиоидные пептиды (эндорфины, энкефалины, динарфины... – более 40 известных сегодня пептидов) или несущие на своей мембране опиатные рецепторы, сконцентрированы,

в основном, в структурах лимбической системы (гиппокамп, миндаля, цингулярная кора, паравентрикулярные ядра гипоталамуса и др.), обеспечивающей эмоциональную оценку разнообразных сигналов о рассогласовании.

— ЭОС принято рассматривать как антиноцицептивную систему. Однако современные нейрофизиологические знания не позволяют отнести боль к сенсорной модальности в традиционном понимании (Schmidt, Thews 1987). Сенсорный сигнал о повреждении, наряду с сигналами о холоде, тепле и прикосновении, формируется механорецепторами кожи, а не мифическими «ноцицепторами» (Зевеке 1976, 2004; Цирульников 1990; Зевеке, 1986–2010; Wartolowska, 2011). Боль нельзя подавить периферическими анестетиками, не блокируя все остальные тактильные входы; зато центральные анальгетики эффективно справляются с этой задачей. Боль может возникать при отсутствии повреждения (фантомные боли) и не возникать при его наличии при стрессе (Bodnar et al. 1978; Zurita et al. 2000). Наконец, не существует такой физической реальности, как боль, в отличие от света, звука, давления и т.д. Тогда что же такое боль? По нашему мнению, боль – это субъективное отображение чрезмерного рассогласования между ожидаемыми и реальными сигналами. В таком случае, роль ЭОС здесь заключается в прерывании сигнала о наличии рассогласования, что и наблюдается во время стресса или при действии наркотических анальгетиков (Парин 2010; Парин и др. 2011).

— В-третьих, при стрессе на стадии тревоги активация ЭОС приводит к «загрублению» всех сенсорных порогов и подавлению когнитивной сферы, а на стадии истощения ЭОС становится монополярной «хозяйкой» положения, переводя организм в энергосберегающий гипобиотический режим (Парин 2008, 2010).

Таким образом, ЭОС может рассматриваться как главный кандидат на роль нейрхимического «прерывателя» сигналов о рассогласовании в нейронных сетях. Это положение позволяет с иного ракурса, через призму концепции активности, рассматривать такие значимые для выживания феномены, как научение, стресс, боль, стереотипия, подкрепление, аддикции и т.д.

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ЗРИТЕЛЬНО-ПРОСТРАНСТВЕННЫЕ ОСОБЕННОСТИ У ДЕТЕЙ РАННЕГО ВОЗРАСТА С СИНДРОМАМИ ВИЛЬЯМСА И АУТИЗМА ПРИ ВЫПОЛНЕНИИ ЗАДАЧИ А-NOT-B

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В исследованиях функциональной асимметрии мозга были получены данные о наличии правополушарного дефицита у людей с синдромом аутизма (Boddaert et al., 2004; Gunter et al., 2002; Stroganova et al., 2010). Эти данные подтверждаются как изменением морфологии мозга (Gunter et al., 2002; Boddaert et al., 2004; Червяков А. В., Фокин В. Ф., 2007), так и функциональными нарушениями внимания и пространственных способностей при синдроме аутизма (Tsetlin M. et al., 2009; Stroganova et al., 2010).

В то же время, при нейрофизиологическом нарушении – синдроме Вильямса (СВ), который часто противопоставляют синдрому аутизма, ярко выражены нарушения пространственных функций (Bellugi U. et al., 1990; Morris C. A., Mervis C. B., 2000; Atkinson J. et al., 2003; Meyer-Lindenberg et al. 2004). Существуют данные о нарушениях строения и функционирования теменных отделов коры больших полушарий, наиболее выраженные в левом полушарии при СВ (Reiss A. L. et al., 2004, Kippenhan J. S. et al., 2005, Galaburda et al., 2002, 2007). И, поскольку при синдроме аутизма морфофункциональные нарушения правого полушария сопровождаются асимметричным нарушением зрительно-пространственных способностей, интересным представляется исследование зеркального паттерна нарушения пространственных способностей при СВ. Однако на данный момент нет исследований зрительно-пространственной асимметрии у детей с СВ.

Задача А-not-B (Diamond et al., 1997) является пробой на отсроченный ответ, позволяющей оценить также и зрительно-пространственные способности. В предыдущем исследовании нами был описан дефицит возможностей рабочей памяти у детей раннего возраста с синдромами Вильямса и аутизма

при выполнении этой задачи (Перминова Г. А., Бурдукова Ю. А., 2010).

В настоящей работе мы исследовали асимметрию выполнения задачи А-not-B детьми с СВ. В качестве дополнительного контроля были взяты дети с синдромом аутизма.

Выборка: в исследовании приняли участие 38 детей: 17 типично развивающихся детей (ТР), 9 с синдромом Вильямса (СВ) и 12 с аутизмом (А). Хронологический возраст (лет, среднее±стандартное отклонение) ТР 2,1±0,7, СВ – 3,6±1,2, СА – 3,6±0,6. Возраст психомоторного развития: у ТР детей 2,1±0,8 года, у детей с СВ – 1,8±0,5 года, у детей с А – 2,5±0,5 года.

Методика: для оценки психомоторного развития детей ТР и СВ был использован тест Бейли (Bayley BSID II, 1993). Для оценки психомоторного развития детей с аутизмом был использован тест PEP (Schopler et al., 1990). Для изучения зрительно-пространственных способностей использовалась задача А-not-B (Diamond et al., 1997). В этой задаче ребёнку нужно было найти привлекательный объект, спрятанный на его глазах в одном из двух местоположений слева или справа от средней линии, после того, как несколько раз подряд он находил его в противоположном местоположении. Подсчитывалось количество «левых» и «правых» проб и количество ошибок слева и справа.

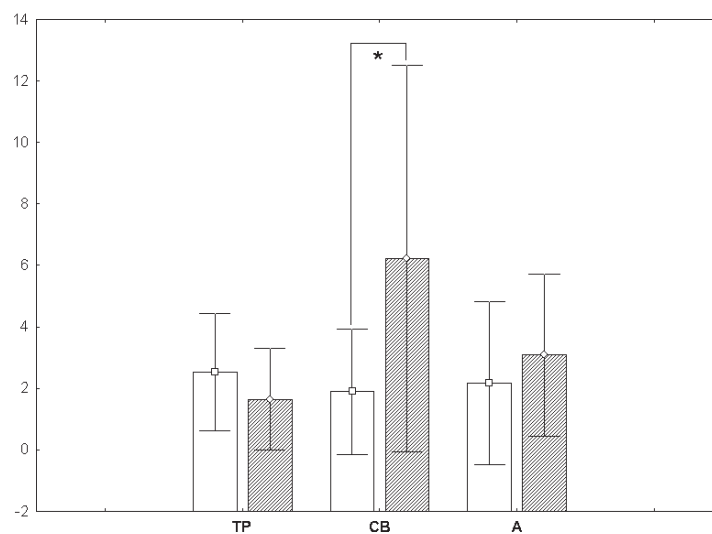


Рис 1. Асимметрия ошибок слева и справа в трех группах детей. По оси X: группы детей; По оси Y: количество ошибок при выполнении пробы. Белые столбцы – ошибки слева, серые столбцы – ошибки справа. * – $p < 0,03$.

Результаты: Проведен дисперсионный анализ с факторами повторных измерений (независимый фактор — группа; фактор повторных измерений с 2 уровнями — левая и правая сторона предъявления, зависящая переменная — количество ошибок слева и справа, ковариаты: возраст психического развития, количество «левых» и «правых» проб). Анализ плановых сравнений выявил, что дети СВ делают значимо большее количество ошибок справа $F(1,32) = 5,32, p < 0,03$ (рис 1). Значимых различий в количестве ошибок слева и справа в двух других группах, ТР и А, не было выявлено.

Отсутствие асимметрии в выполнении задачи А-not-В у детей с аутизмом может объясняться ее простотой для детей указанного возраста (McEvoy et al., 1992).

Выполнение задачи А-not-В детьми раннего возраста с синдромом Вильямса, в отличие от двух других групп ТР и А, явно асимметрично, то есть зависит от стороны предъявления. Они значимо чаще ошибаются в «правых» пробах, чем в «левых».

Принимая во внимание, что в обеспечении зрительно-пространственных функций значительную роль играют теменные отделы коры больших полушарий (Kippenhan J. S. et al., 2005), наши данные свидетельствуют об асимметричном, левостороннем нарушении теменных отделов левого полушария при синдроме Вильямса.

Таким образом, выявленный в нашем исследовании дефицит при синдроме Вильямса теменных функций левого полушария может вносить свой вклад в объяснение поведенческого фенотипа при синдроме Вильямса.

НЕЕВКЛИДОВА ГЕОМЕТРИЯ В СЕМАНТИЧЕСКИХ ПРОСТРАНСТВАХ

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Любое научное описание реальности всегда вторично, поскольку начинается с её репрезентации в нашем сознании. Отсюда встает проблема адекватного переноса «первосигнальной» интерпретации (по И.П. Павлову) в знаковую «второсигнальную» интерпретацию, принятую в конкретной науке. Любая неадекватность этой реинтерпретации неизбежно приведет к смысловым противоречиям с нашим опытом.

Выдающийся математик А. Пуанкаре (один из творцов теории относительности наряду с А. Эйнштейном) еще в 1887 г. в работе «Об основных гипотезах геометрии» впервые поставил вопрос о выборе геометрии для описания физических явлений. Он утверждал, что геометрия реального пространства в принципе не допускает экспериментальной проверки, поскольку ни в каком опыте нельзя проверить чистую геометрию как таковую. Проверке подлежит только совокупность «геометрия плюс физика» в целом. Допустим, наблюдения показали, что распространяющийся в пространстве луч света искривляется. Объяснить этот факт можно, либо предполагая пространство неевклидовым, либо полагая, что в евклидовом пространстве какая-то сила искривляет световой луч. Таким образом, один и тот же экспериментальный результат совмещается с совершенно

различными геометриями, хотя физические законы для этих двух геометрических картин будут различными. «Другими словами, — пишет Пуанкаре, — аксиомы геометрии ... суть не более чем замаскированные определения. Если теперь мы обратимся к вопросу, является ли евклидова геометрия истинной, то найдем, что он не имеет смысла. Это было бы все равно, что спрашивать, какая система истинна — метрическая или же система со старинными мерами, или какие координаты вернее — декартовы или же полярные. Никакая геометрия не может быть более истинна, чем другая; та или иная геометрия может быть только более удобной» (1983: 41]. Рассматривая последовательно пространство визуальное, тактильное и моторное, Пуанкаре формулирует характерные черты пространства представлений, которое, в отличие от геометрического пространства, ни однородно, ни изотропно; нельзя даже сказать, что оно имеет три измерения, но можно сказать, что «в силу естественного отбора наш ум приспособился к условиям внешнего мира, что он усвоил себе геометрию, наиболее выгодную для вида, или, другими словами, наиболее удобную» (1983: 62). «Евклидово пространство не есть форма, наложенная на нашу чувственность, потому что мы можем вообразить себе неевклидово пространство; но оба пространства — евклидово и неевклидово — имеют одно общее основание, тот аморфный континуум, о котором я говорил вначале; из этого континуума мы можем извлечь то евклидово пространство, то пространство

Лобачевского — так же, как, реализуя соответствующее градуирование, мы можем из неградуированного термометра сделать либо термометр Фаренгейта, либо термометр Реомюра. Тогда возникает вопрос: не является ли этот аморфный континуум, который наш анализ оставил существующим, формой, наложенной на нашу чувственность? Мы расширили бы тюрьму, в которой заключена наша чувственность, но это все-таки была бы тюрьма» (1983, с. 182).

Другими словами, если отображение так называемой «внешней реальности» осуществляется посредством нашей «чувственности» на некоторой «ментальной карте» (или в семантическом пространстве (Петренко, 1997, 2011)), то от особенностей её «градуирования» будет зависеть и «наиболее удобная» метрика физического пространства, в котором мы пытаемся реконструировать локализацию и динамику объектного представления реальности. Если учесть то, что наши ощущения представляются в семантическом пространстве в полярных координатах (см. ниже), то можно показать, что отсюда следуют предельные значения воспринимаемых интенсивностей ощущений и неевклидовость метрики ментальной карты (Suprun, 2009) (или «тюрьмы нашей чувственности», по выражению А. Пуанкаре).

В самом деле: пусть объект Ω ментально-го пространства первой сигнальной системы отображается в вектор $\vec{U} = U(q_1, q_2, \dots, q_n)$ в пространстве свойств $\{q_1, q_2, \dots, q_n\}$ [Супрун и др., 2007] второй сигнальной системы по И.П. Павлову¹. Легко установить неадекватность этого отображения на простом примере: мы сливаем две порции кофе (Ω' и Ω'') вместе. В векторном сложении объектов координаты свойств должны складываться, т.е., если $\Omega' \rightarrow \vec{U}'$; $\Omega'' \rightarrow \vec{U}''$ и $\Omega = \Omega' \cup \Omega'' \rightarrow \vec{U}$, то должно выполняться соотношение описывающее «суммарный» объект Ω :

$$\vec{U} = \vec{U}_1 + \vec{U}_2 = U(q_1' + q_1'', q_2' + q_2'', \dots, q_n' + q_n'').$$

Однако ни вкус (q_1), ни запах (q_2), ни скорость (q_3), если мы находились в движущейся системе отсчета, при этом не изменились: $q_1' = q_1'' = q_1$; $q_2' = q_2'' = q_2$; $q_3' = q_3'' = q_3$, хотя масса объекта (q_n) и связанные с ней характеристики (объем, вес и т.д.), действительно складываются по правилам векторного пространства. Такая ситуация возможна только в том случае, если в нашем представлении используются

одновременно и угловые и линейные координаты. Очевидно, что угловые координаты вектора (q_1, q_1', q_1''), определяющие его направление, при удвоении его длины не изменятся. Но его длина, которую мы вынуждены соотносить с массой q_n , действительно возрастет вдвое.

Следовательно, для того, чтобы сделать отображение $\Omega = \Omega' \cup \Omega'' \rightarrow \vec{U}$ адекватным ментальной карте даже при описании одного свойства q_i , нам потребуется не одномерное пространство, а плоскость².

Вначале сделаем отображение угловой величины в линейную: $q_i \rightarrow V_i = C_{(i)} \cos \varphi_i$, здесь $C_{(i)}$ — некоторая константа, определяющая меру (масштаб) изменчивости данного свойства) и пе-

рейдем к записи: $\vec{U}_i = \{|\vec{U}_i| \cdot \cos \varphi_i; |\vec{U}_i| \cdot \sin \varphi_i\} = \{|\vec{U}_i| \cdot v_i; |\vec{U}_i| \cdot v_{Hi}\} = |\vec{U}_i| \cdot (v_i \vec{e}_i + v_{Hi} \vec{e}_H) = \{U_i; U_H\}$, поскольку угол может быть определен пространстве не менее двух измерений. Здесь \vec{e}_i и \vec{e}_H — единичные вектора, $|\vec{U}_i|$ — длина проекции вектора \vec{U} на «плоскость i -го свойства»: $\vec{e}_i \times \vec{e}_H$ (см. рис. 1), выраженная через «линейную» составляющую U_i (ригидность свойства) и его «угловую» составляющую φ_i (интенсив-

ность свойства). Очевидно, $\cos \varphi_i = V_i / C_{(i)} = v_i$; $v_{Hi} = \sin \varphi_i = \sqrt{1 - \cos^2 \varphi_i} = \sqrt{1 - v_i^2} = \sqrt{1 - V_i^2 / C_{(i)}^2}$.

Таким образом, для адекватного семиотического отображения свойства в языке нам необходимо не только указывать его качество и интенсивность (задавать угол φ_i), но и ригидность³ (длину вектора U_i), т.е. **устойчивость свойства к изменению его интенсивности**. Именно это представление объектов может быть названо семантическим. При таком определении все интенсивности свойств оказываются ограниченными⁴, поскольку $-1 \leq \cos \varphi_i \leq 1$ и неизбежно приводят к неевклидовой метрике пространства свойств (Suprun, 2009).

² Поскольку задание угла возможно в плоском континууме.

³ Действительно, в физике **масса** по определению есть **устойчивость** такого свойства, как **скорость**, к действию силы, направленной на ее изменение. А **устойчивость** к изменениям и есть **ригидность**.

⁴ Например, предельная механическая скорость C в физике, или интроверсия в психологии и пр. Причем эта ограниченность связана не с «законами природы», а с характером представления свойств на ментальной карте субъекта в любой системе референции.

¹ Описание объекта лингвистами через перечисление его свойств и их выраженности аналогично векторному представлению его в пространстве свойств.

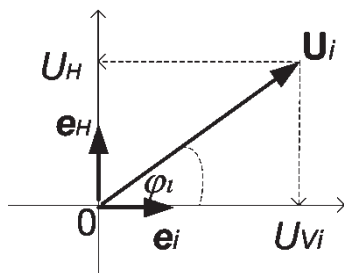


Рис. 1. Представление объекта на ментальной карте.

Отсюда получаем, что в общем случае свойство объекта адекватно отображается в семантическом пространстве как линейная одномерная величина:

$$|\vec{U}_i| = \frac{U_H}{\sin \varphi_i} = \frac{U_H}{\sqrt{1 - \cos^2 \varphi_i}} = \frac{U_H}{\sqrt{1 - V_i^2 / C_{(i)}^2}}$$

Тогда

$$U_{Vi} = |\vec{U}_i| \cos \varphi_i = \frac{U_H}{\sqrt{1 - V_i^2 / C_{(i)}^2}} v_i =$$

$$\frac{U_H / C_{(i)}}{\sqrt{1 - V_i^2 / C_{(i)}^2}} V_i = \frac{M_{0(i)}}{\sqrt{1 - V_i^2 / C_{(i)}^2}} V_i = M_{(i)} \cdot V_i = P_i$$

что совпадает с релятивистским импульсным описанием физического объекта (в случае единственного свойства V) в пространстве Минковского. Здесь M_0 – масса покоя, а M – полная масса объекта, P – импульс).

Даже размерность пространства, по мнению Пуанкаре, не является predetermined и зависит от особенностей организации нашей «чувственности». «Характерная особенность пространства, выражающаяся в том, что оно обладает тремя измерениями, есть, таким образом, особенность нашего распределительного щита, есть, так сказать, внутреннее свойство человеческого ума. Достаточно было бы разрушить некоторые из соединений, т. е. некоторые

ассоциации идей, чтобы получить другой распределительный щит, а этого было бы достаточно, чтобы пространство приобрело четвертое измерение. Такой результат может удивить некоторых. Ведь внешний мир, скажут они, должен же играть здесь какую-то роль. Если число измерений зависит от того, как мы созданы, то можно предположить, что мыслящие существа, живущие в нашем мире, но созданные иначе, чем мы, полагали бы, что пространство имеет больше или меньше трех измерений. И не утверждал ли Цион, что японские мыши, имеющие только две пары полукружных каналов, думают, что пространство имеет два измерения? А подобное мыслящее существо, если бы оно было способно создать физику, разве не построило бы физики двух или четырех измерений, физики, которая, в известном смысле, была бы такою же, как и наша, ибо она описывала бы другим языком тот же самый мир?» (1983: 39]. Отметим, что в психосемантике (впрочем, так же, как и в современной физике, например, в теории струн) описание реальности осуществляется в многомерных пространствах (Петренко, 2010). Очевидно, что адекватное представление ментальной карты в семантических пространствах есть первый и чрезвычайно важный шаг на пути когнитивного моделирования реальности, от которого будут существенно зависеть все последующие построения и выводы.

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НЕЙРОФИЗИОЛОГИЧЕСКИЕ МЕХАНИЗМЫ ПРАВИЛЬНОГО И ОШИБОЧНОГО ОПОЗНАНИЯ ФРАГМЕНТАРНЫХ ИЗОБРАЖЕНИЙ У ДЕТЕЙ ПРЕДШКОЛЬНОГО И МЛАДШЕГО ШКОЛЬНОГО ВОЗРАСТА

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Изучение мозговой организации когнитивных процессов в предшкольном и младшем

школьном возрасте играет важную роль для понимания функциональных возможностей ребенка в период подготовки к школе и в процессе самого систематического обучения. Возраст от 5–6 к 7–8 годам является этапом интенсивного созревания мозговых структур, осуществляющих

анализ зрительной информации (Фарбер, 2003: 114–125). Тем не менее, многие звенья этой системы сохраняют, особенно у детей дошкольного возраста, черты функциональной незрелости, что может приводить к ошибкам в опознании объектов. Согласно данным ряда авторов, было установлено, что по числу ошибок и уровню фрагментации опознаваемого изображения наблюдаются значимые различия между детьми дошкольного и младшего школьного возраста (Parkin, A.J., 1993:191–206; Cysowicz et al., 2000:19–35). Целью нашего исследования было выявление возрастных особенностей опознания изображений разного уровня фрагментации на нейрофизиологическом уровне.

Исследование проводилось на 11 детях 5–6 лет (средний возраст $6,1 \pm 0,15$) и 12 детях 7–8 лет (средний возраст $7,85 \pm 0,21$), сделавших 6 и более ошибок опознания фрагментарных изображений. В качестве стимулов использовались картинки знакомых предметов и животных разной фрагментации (Snodgrass J.G., Corwin J., 1988:6–36), предъявляемые последовательно от наиболее фрагментарного уровня до полного изображения (8 уровень). На основании поведенческих данных анализировалась точность опознания по числу ошибок и его эффективность, оцениваемая по уровням фрагментации, на которых правильно и ошибочно опознается изображение. Представленные нами нейрофизиологические результаты основаны на анализе параметров связанных с событием потенциалов (ССП) при правильном и ошибочном опознании. Усредненные СПП анализировались методом главных компонент. Далее проводилась статистическая обработка амплитуд СПП на временных отрезках, соответствующих выделенным главным компонентам (ANOVA Repeated measure, Wilcoxon). Исследование поведенческих показателей опознания фрагментарных изображений выявило их существенные различия у детей 5–6 и 7–8 лет. Средний уровень фрагментации, на котором происходило правильное опознание, в дошкольном возрасте составляет $6,3 \pm 0,97$, у детей 7–8 лет – $5,3 \pm 0,1$ ($Z = -5,3$; $p < 0,0001$), что указывает на необходимость суммации большего числа сенсорных признаков для опознания фрагментарных изображений в 5–6 лет по сравнению с детьми 7–8 лет. В обеих возрастных группах уровень фрагментации ошибочного опознания (5–6 лет: $4,1 \pm 0,1$, 7–8 лет: $3,7 \pm 0,1$) был значимо (5–6 лет: $Z = -3,1$; $p < 0,002$; 7–8 лет: $Z = -3,2$; $p < 0,001$) более низким по сравнению с правильным, то есть ошибки происходили при явном недостатке информации, когда предъявляемая картинка

составляла около 50% от полного изображения. Результаты нейрофизиологического исследования позволили выявить существенные различия в характере вовлечения различных корковых структур в процесс идентификации фрагментарных изображений у детей дошкольного и младшего школьного возраста. В 5–6 летнем возрасте различия между правильно и неправильно опознанными изображениями выражены преимущественно в вентролатеральной префронтальной коре (области F7, F8), напрямую связанной с лимбической системой. Этот факт дает основания предполагать, что у детей 5–6 лет большую роль при опознании играет эмоциональная составляющая. У 7–8 летних детей различия отмечены как в областях F7 и F8, так и в дорзолатеральной префронтальной коре (области F3, F4), являющейся одной из ключевых зон при опознании неполных изображений у взрослых (Sehatpour P. et al., 2006:605–615; Фарбер, Петренко, 2008:5–18). Вентролатеральная, как и дорзолатеральная префронтальная кора играет важную роль в обеспечении регуляторных (управляющих) механизмов, однако функции этих зон префронтальной коры различны. Дорзолатеральные префронтальные отделы ответственны за пространственную информацию, вентролатеральные – связаны с непространственными характеристиками зрительного стимула (Goldman-Rakic P., 1995:71–83). Эти представления опираются на исследования зрительного восприятия, согласно которым дорзальные пучки волокон, идущие от зрительной коры к префронтальным отделам, связаны с информацией о том, «где» располагается объект, а вентральные – с информацией о том, «что» это за объект. Дорзальные отделы так же включаются, при необходимости активного манипулирования информацией и при отслеживании (мониторинг) стимулов (Petrides, 1996:57–63; Curtis et al., 2000: 1503–1510). Можно предположить, что дети разного возраста используют разные признаки изображения при опознании и, как следствие, стратегии опознания фрагментарных изображений у них различны. Это необходимо учитывать при работе с детьми дошкольного и младшего школьного возраста.

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ВОЗМОЖНОСТИ НЕЙРОПСИХОЛОГИЧЕСКОГО ПОДХОДА В ПРЕДСКАЗАНИИ УСПЕШНОСТИ ОБУЧЕНИЯ

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Нейропсихологический подход зарекомендовал себя как адекватный инструмент для изучения детей, испытывающих трудности в обучении, поскольку позволяет обнаружить конкретные механизмы, лежащие в основе специфических трудностей младших школьников и связанные с недостаточным уровнем сформированности отдельных функций и их компонентов (Ахутина, Пылаева 2008, Hale 2004). С другой стороны, некоторые исследователи указывают на существование взаимосвязи успешности обучения с состоянием психических функций ребенка, в частности, управляющих функций (Diamond 2007).

Подобные исследования позволяют предположить, что данные нейропсихологического подхода могут не только объяснять уже имеющиеся трудности, но и служить целям предсказания возможных будущих трудностей в обучении. Для проверки этой гипотезы на базе центра образования и детского сада Москвы

было осуществлено исследование 81 ребенка дошкольного возраста с использованием «Методики нейропсихологического обследования детей 5–9 лет» (Ахутина и др. 2008). После обработки данных 28 проб было получено более 250 параметров. Те из них, которые позволяют оценивать состояние компонентов ВПФ наиболее дифференцированно, объединялись в индексы (см. таблицу 1). Поскольку система оценки нейропсихологических проб представляет собой штрафные баллы, высокие показатели индексов соответствуют низкому уровню развития отдельных функций.

Результаты данного исследования показывают, что, во-первых, состояние всех исследуемых функций у разных детей достаточно сильно различается, на что указывает разброс данных и величина стандартного отклонения. А во-вторых, существуют функции, уровень развития которых к школьному возрасту оказывается сравнительно высоким у большинства дошкольников, – это функции серийной организации движений и речи, переработки кинестетической и слуховой информации, регуляции активности и аналитической стратегии переработки информации. Функции произвольной регуляции

Индексы	Минимальные значения	Максимальные значения	Средние значения	Стандартные отклонения
1. произвольная регуляция	-8,58*	32,45	3,23	6,72
2. серийная организация	-8,72	11,54	-0,25	3,79
3. переработка кинестетической инф	-3,84	16,95	2,75	3,64
4. переработка слуховой инф	-13,76	20,05	-1,62	5,07
5. переработка зрительной инф	-4,71	15,48	5,19	4,74
6. переработка зрит-простр инф	-13,14	22,47	4,70	6,20
7. регуляция активности	-2,45	9,73	1,89	2,61
8. аналитическая стратегия	-7,63	10,44	0,50	3,97
9. холистическая стратегия	-6,94	36,26	4,08	7,53

Таблица 1. Состояние отдельных функций у детей дошкольного возраста

Индексы	Норма	Трудности письма		Трудности чтения		Трудности математики	
	ср. знач	ср. знач	знач. разл	ср. знач	знач. разл	ср. знач	знач. разл
1	1,27	3,37		2,46		3,68	
2	0,07	1,58		-0,45		1,36	
3	3,53	3,92		4,15		3,80	
4	-2,76	4,61	p<0,05	6,49	p<0,05	5,68	p<0,05
5	4,25	8,68	p<0,05	8,68	p<0,05	7,39	p<0,05
6	3,18	8,13	p<0,05	8,01	p<0,05	9,79	p<0,01
7	0,73	3,33	p<0,01	2,06		2,59	
8	-0,90	3,58	p<0,05	4,30	p<0,01	3,87	p<0,05
9	2,30	5,59		6,12	p<0,05	8,39	p<0,01

Таблица 2. Состояние психических функций у детей с трудностями обучения и успешно обучающихся

деятельности, переработки зрительно-пространственной информации и холистической переработки информации характеризуются более низким уровнем развития, что объясняется данными о гетерохронии созревания мозговых структур (Марютина 1994).

На втором этапе исследования нами была отслежена успешность обучения 40 детей в первом и во втором классах. На основе полученных данных эти школьники были разделены на 4 группы: с трудностями обучения письму (7 человек), чтению (5 испытуемых), математике (6 человек) и успешно обучающиеся по этим предметам дети (26 человек). Важно отметить, что некоторые дети имели сочетанные трудности письма и чтения, а в редких случаях и трудности в овладении математическими навыками.

Показатели сформированности отдельных функциональных компонентов ВПФ в группе успешных школьников выше (что отражается в более низких значениях), чем в группах с различными типами трудностей обучения (таблица 2). Причем, значимыми различия оказываются, в основном, по отношению к функциям второго блока: переработки слуховой, зрительной, зрительно-пространственной информации. При этом детей с трудностями обучения письму отличает низкий уровень функционирования энергетического компонента деятельности, детей с трудностями чтения – сложности в овладении аналитической стратегией переработки информации, а детей с трудностями в математике – холистической стратегией. Особый интерес представляет отсутствие значимых различий в

уровне сформированности функций программирования, регуляции и контроля деятельности, что объясняется спецификой овладения данными функциями, когда основной «скачок» в их развитии происходит от первого ко второму классу (Полонская, 2007).

Таким образом, результаты данного исследования убедительно показывают не только возможность использования нейропсихологического подхода для предсказания успешности обучения детей дошкольного возраста при поступлении в школу, но и прогнозирования конкретных видов трудностей в обучении, что открывает возможности для своевременной профилактики этих трудностей, благодаря целенаправленной коррекционно-развивающей работе.

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МОДЕЛИРОВАНИЕ ИНЕРЦИОННЫХ И ПРЕДСКАЗАТЕЛЬНЫХ МЕХАНИЗМОВ СЛУХА ПРИ ВОСПРИЯТИИ ДВИЖЕНИЯ ЗВУКА

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Сенсорное восприятие неизбежно отстает во времени от внешних событий. Это отставание связано с задержками в поступлении информации в мозг и инерционностью нервных процессов, участвующих в обработке сенсорной информации. Если внешний стимул находится в движении, то за время запаздывания ощущения он пройдет определенное расстояние и будет восприниматься позади своего истинного положения. Между тем исследования на человеке показывают, что воспринимаемое положение движущегося звукового стимула не только не отстает, но, напротив, может опережать стимул, смещаясь кпереди от его текущего положения. Эффект опережения свидетельствует о способности мозга преодолевать отставание в собственной работе и может рассматриваться как выражение своеобразного сенсорного предсказания.

Предполагается, что действие инерционного процесса может преодолеваться посредством предсказательного механизма, формирующегося при восприятии движения источника звука. Оценить конкурентное взаимодействие этих двух противоположных процессов можно на основании субъективных оценок положения начальной и конечной точек траектории движения стимула. Фактор инерционности восприятия проявляется сразу после включения сигнала. Типичным примером инерционного процесса является субъективный сдвиг начальной точки траектории движения стимула в направлении его движения. Фактор предсказания, требующий определенной информации о движении стимула, формируется по мере поступления этой информации и может сказываться на восприятии конечной точки траектории движения стимула.

В данной работе локализация человеком начальной (НТ) и конечной (КТ) точек траектории движения звукового стимула исследовалась при предъявлении шумовых сигналов с плавным и скачкообразным перемещением по азимуту. В опытах участвовали 19 испытуемых с нормальным слухом. Движение стимула создавалось посредством динамических изменений

межушной задержки (ΔT) в предъявляемых сигналах. Стимулы перемещались от средней линии головы ($\Delta T = 0$) к правому и левому уху. Длина угловой траектории движения стимула задавалась конечной величиной ΔT в сигнале ($\Delta T = \pm 40, \pm 120, \pm 200, \pm 300, \pm 400, \pm 500, \pm 600, \pm 700, \pm 800$ мкс). Скорость движения стимула варьировалась путем изменения длины траектории движения и его длительности (100 и 200 мс). Ответы испытуемых о воспринимаемом пространственном положении стимула регистрировали при помощи графического планшета. С помощью неподвижных стимулов (с фиксированной ΔT) определяли зависимость между угловым положением стимула и величиной ΔT , которая в последующем использовалась для расчета углового положения стимула. При предъявлении движущихся стимулов испытуемые определяли положение НТ и КТ траектории движения звукового стимула. На основании данных оценок испытуемых строили индивидуальные и среднegrupповые кривые зависимости величины смещения воспринимаемого положения стимула относительно его реального положения в начале и в конце движения.

Воспринимаемое положение НТ траектории движения стимулов было смещено в направлении движения. Величина этого смещения увеличивалась с увеличением скорости движения. При длительности стимула 200 мс смещение начальной точки возрастало до $11\text{--}12^\circ$ с увеличением длины траектории от 7 до 60° для плавно движущихся стимулов и до $3\text{--}4^\circ$ при скачкообразном перемещении стимула на $7\text{--}20^\circ$. При дальнейшем увеличении величины скачка (до 70°) величина смещения оставалась постоянной. При длительности стимулов 100 мс изменения величины смещения НТ от скорости движения носили сходный характер. При этом смещение достигало значений $15\text{--}17^\circ$ для плавно движущегося стимула и $7\text{--}9^\circ$ для скачкообразного движущегося стимула. Таким образом, величина смещения воспринимаемого положения НТ возрастала при переходе от скачкообразного движения к плавному и при уменьшении длительности сигнала, т. е. увеличении скорости движения.

Вычисленное на основании величины смещения НТ и скоростей движения стимула время формирования пространственной оценки не зависело от длины траектории движения и длительности стимулов и в среднем по группе

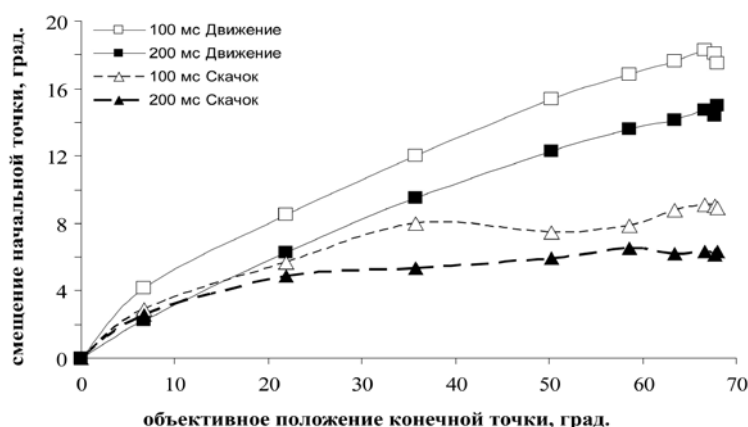


Рис. 1. Величина смещения воспринимаемого положения начальных точек относительно объективного в зависимости от длины траектории при разной длительности и разных паттернах движения субъективного звукового образа.

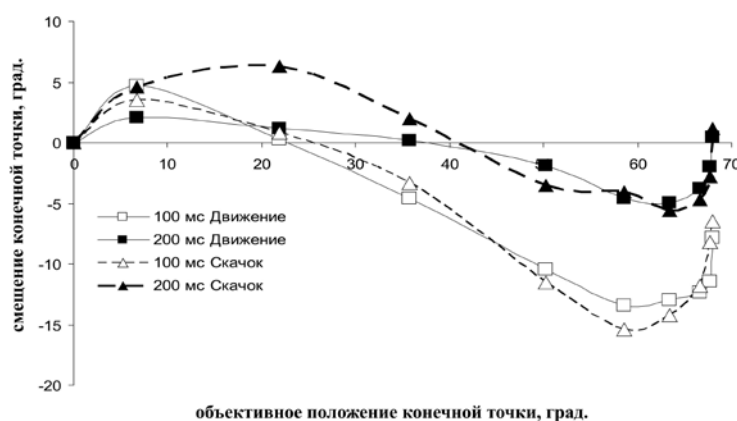


Рис. 2. Величина смещения воспринимаемого положения конечных точек относительно объективного в зависимости от длины траектории при разной длительности и разных паттернах движения субъективного звукового образа.

составило 47 ± 5 мс. Значение этого параметра сильно различалось у разных испытуемых.

Исследование локализации конечной точки траектории движения стимула показало, что на относительно высоких скоростях движения воспринимаемое положение этой точки смещено относительно конечного положения стимула в сторону, противоположную направлению движения. Максимальная величина обратного смещения (или отставания) составляла $4-5^\circ$ для стимулов длительностью 200 мс и достигала 12° для стимулов длительностью 100 мс. Эффект отставания возрастал пропорционально скорости движения стимула. При переходе к относительно низким скоростям движения эффект отставания ослаблялся и сменялся противоположным эффектом – сдвигом субъективного положения КТ стимула кпереди от его реального положения (эффект опережения).

Эффект опережения, возникающий при малых скоростях движения стимула, можно рассматривать как проявление предсказательной способности слуховой системы. Ограничение эффекта по диапазону скоростей можно объяснить действием противоположного – инерционного процесса, влияние которого возрастает с увеличением скорости движения стимула. Взаимодействие этих двух конкурентных процессов рассматривается на примере модели, в которой инерционный процесс представлен интегратором с определенным временным окном и предсказателем, формирующим прогностические оценки по ходу движения стимула.

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ИССЛЕДОВАНИЕ ПРОЦЕССА РЕШЕНИЯ И РЕПРЕЗЕНТАЦИИ ЗАДАЧИ ВЫБОРА П. УЭЙЗОНА

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В исследовании человеческого мышления широко изучается способность человека к дедуктивным умозаключениям, с необходимостью следующим из исходных посылок. Условное утверждение – «Если А, то В» состоит из антецедента (р) (Если А) и консеквента (q) (то В). Одно из существенных правил о том, как делать выводы в логике условных высказываний, носит название *modus ponens* (Если А, то В. А. Следовательно, В). Вывод в соответствии с этим правилом намного проще для человека, чем в соответствии с правилом *modus tollens* (Если А, то В. В неверно. Следовательно, и А неверно). Одним из наиболее ярких примеров неспособности применения *modus tollens* является задача выбора П. Уэйзона (1966).

Испытуемому предъявляются четыре карточки:

Е	К	4	7
р	не-р	q	не-q

Ему сообщается, что на одной стороне карточки изображена буква, а на другой – цифра. Его задача – оценить справедливость правила, относящегося только к этим карточкам: *Если на одной стороне карточки изображена гласная буква, то на другой ее стороне – четное число*. Большинство испытуемых переворачивают карточки Е и 4, что является логически неверным выбором. Правильный ответ – перевернуть карточки Е и 7, потому что нечетное число на обороте карточки с Е опровергло бы правило, как и гласная буква на обороте карточки с 7. Испытуемые показывают, таким образом, неспособность использования *modus tollens* для определения ложности предпосылки (неспособность перевернуть 7).

Значительное количество исследований было посвящено выяснению причин появления данных тенденций. При этом все они постулировали особый («логический») характер мышления, которое используется при решении этой задачи. По нашему мнению, они недостаточны для объяснения особенностей репрезентации этой задачи, которые влекут за собой наиболее частотный способ ее решения.

Таким образом, целью нашего исследования было изучение репрезентации задачи выбора Уэйзона, лежащей в основе ее решения, а также установление зависимости успешности решения задачи выбора от ее материала и структуры.

Нами были выдвинуты следующие гипотезы:

1. Задача выбора Уэйзона решается с помощью обратимой операции (в смысле Ж. Пиаже).
2. Задача выбора Уэйзона репрезентирована с помощью двух обратимых связок: р и q и не-р и не-q.

Под операцией обратимости, в данном случае, подразумевается ментальная процедура, которая переводит предмет из состояния А в состояние В, и обратно, не изменяя его (логическая связь «Если А, то В» также значит для испытуемых «Если В, то А»).

В первой экспериментальной серии нами проверялась гипотеза о наличии операции обратимости в репрезентации задачи выбора. Эксперимент состоял в решении каждым испытуемым (n = 23) десяти задач, разработанных по аналогии с задачей Уэйзона – двух задач с «абстрактным» материалом и трех задач с «реальным» материалом. Для проверки операции обратимости каждая задача, при неизменности карточек, предъявлялась испытуемому с «прямым» (Если на одной стороне карточки написана гласная буква, то на другой ее стороне – четное число) и «обратным» правилом (Если на одной стороне карточки написано четное число, то на другой ее стороне – гласная буква). Все задачи предъявлялись в случайном порядке. Для того, чтобы проверить, действительно ли испытуемый решает задачу, а не выбирает карточки случайно, после решения каждой задачи испытуемый должен был придумать аналогичную задачу. В расчет брались только те испытуемые (n = 21), у которых составленная задача соответствовала предъявляемой им задаче, то есть правило к своей задаче и ответы на нее были аналогичны предъявленной. Предполагалось, что решения задач при прямой и обратной формулировке правила будут одинаковыми. По всем типам задачи нами анализировались соответствия между решениями задач (выборами карточек испытуемыми) в названных двух случаях. По результатам был высчитан биномиальный критерий, значение которого оказалось высоко значимым (p < 0,0001). Различия в успешности решения между разными типами задач не достигали уровня значимости.

Вторая серия экспериментального исследования была направлена на проверку гипотезы о наличии двух обратимых связей в репрезентации задачи выбора. Каждый испытуемый ($n = 40$) решал две полные (например, классическая задача выбора) и две редуцированные (только с двумя карточками – p и $\neg q$) задачи с абстрактным и конкретным материалом. Редукция была произведена нами проверки предположения, что и в этом случае репрезентация испытуемого не изменится. После решения задачи испытуемому к каждой карточке задавались вопросы о том, что там будет, может ли быть что-то еще и т.д., для определения того, что находится на обратной стороне карточек для изучения репрезентации испытуемого. Предполагалось, что испытуемые попарно свяжут карточки p и q и $\neg p$ и $\neg q$, и что задачи с редуцированным количеством карточек будут решаться так же, как и полные задачи.

Сочетание ответов испытуемых, свидетельствующих о связи карточек p и q и $\neg p$ и $\neg q$, оказалось высоко значимым как для полных, так и для редуцированных задач (биномиальный критерий, в обоих случаях $p < .0001$). Из чего мы можем сделать вывод о том, что испытуемые репрезентируют задачу выбора, как две обратимые связи между антецедентом и консеквентом и не-антецедентом и не-консеквентом. Например, если реконструировать репрезентацию классического варианта задачи выбора (задача с правилом: Если на одной стороне карточки написана гласная буква, то на другой ее стороне – четное число), то она будет следующая (оборотные стороны карточек, с точки зрения испытуемого):

Четное число	Нечетное число	Гласная буква	Согласная буква
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Полученные результаты первой экспериментальной серии свидетельствуют о наличии

обратимой операции, лежащей в основании репрезентации задачи Уэйзона. Для испытуемых не было разницы в прямой и обратной задаче, что нашло свое отражение в высокой частоте соответствующих друг другу ответов, хотя с точки зрения формальной логики, при изменении правила задача становится иной по своему содержанию. Однако испытуемые репрезентировали обе задачи как одинаковые, где консеквент полностью соответствовал антецеденту и наоборот. Таким образом, правило «Если A , то B » также означало для испытуемых «Если B , то A ». Мы считаем, что именно подобная операция обратимости является причиной того, что большинство испытуемых неправильно (с точки зрения правил дедукции) решает данную задачу, подтверждая правило, а не опровергая его. Об этом свидетельствует преобладание в исследованиях ответов E и 4 , а не E и 7 . Полученные результаты второй экспериментальной серии свидетельствуют о том, что задача выбора репрезентирована не с помощью одного правила, данного в условии, а с помощью двух обратимых связей, соединяющих p и q и $\neg p$ и $\neg q$. Соответственно, даже решая задачу Уэйзона правильно с точки зрения дедуктивной логики (выбором p и $\neg q$), испытуемые не опровергали данное им правило, а подтверждали второе правило. Можно сделать вывод о том, что данная задача не актуализирует правил дедуктивного вывода (*modus ponens* и *modus tollens*) и не является валидной для психологического исследования форм логического мышления.

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ХАРАКТЕРИСТИКИ ВОСПРИЯТИЯ ДВОЙСТВЕННЫХ ИЗОБРАЖЕНИЙ

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Человек воспринимает большую часть информации об окружающем мире благодаря зрению. Оно основывается на двухмерных изображениях – паттернах распределения света и тени, проецируемых на слой рецепторов на сетчатке. Тем не менее, мы воспринимаем

трехмерность и глубину пространства. Это возможно благодаря ряду признаков, среди которых важную роль играют так называемые монокулярные признаки глубины. Эти признаки широко используются для изображения глубины и объемности предметов на двухмерной поверхности.

Объектом нашего исследования стали двойственные изображения, обладающие монокулярными признаками глубины. Двойственные изображения – это изображения, при наблюдении

которых происходит реверсия восприятия, обусловленная тем, что в каждый момент времени осознается только один из возможных вариантов видения, то есть периодически происходят произвольные «переключения» с одного варианта изображения на альтернативный. Одним из самых широко известных и изучаемых в настоящее время (Toppino, 2003; Kornmeier et al., 2009 и др.) изображений такого типа является куб Неккера. Это – каркасный куб, нарисованный без соблюдения правил перспективы (ближняя и дальняя грани куба одинакового размера). При этом нельзя однозначно определить, какая из граней находится ближе к наблюдателю, отчего и возникает двойственность восприятия такой фигуры.

В нашем исследовании стимулами служили два изображения. Одним из них была матрица из девяти описанных выше кубов Неккера. Другое изображение – расположенные рядами (пять рядов по пять фигур) затененные с края круги, то есть изображения, яркость которых изменяется от белого к черному, а вектор градиента яркости направлен по горизонтали. Известно (Рок, 1980; Ramachandran, 1988 и др.), что в зависимости от направления вектора градиента яркости (вертикально вверх или вниз) изображение такого полутонового круга воспринимается наблюдателем либо как выпуклая, либо как вогнутая полусфера. При горизонтальном направлении вектора градиента рассматриваемое изображение приобретает характеристики двойственных изображений: наблюдатель, как и в случае с кубом Неккера, видит попеременно то один, то другой из двух возможных вариантов восприятия этого изображения, причем «переключения» восприятия также происходят произвольно. Ранее ни в одной из известных нам работ, посвященных двойственному восприятию, не изучались характеристики восприятия этого двойственного изображения.

Нами были исследованы временные параметры двойственного восприятия описанного выше полутонового изображения, а также изображения куба Неккера, и проведено сопоставление полученных для этих двух изображений данных. В опытах мы регистрировали время, в течение которого у наблюдателей удерживалось восприятие каждого из двух возможных

вариантов видения изображения, и анализировали соотношение этих двух времен для каждого изображения.

Оказалось, что оба изображения имеют предпочитаемый вариант восприятия, который дольше удерживается у наблюдателя в опыте. Наиболее выражена эта тенденция для изображения куба Неккера, чуть менее – для неоднозначно воспринимаемых затененных кругов. Для первого изображения предпочитаемым является вариант, когда передние грани куба воспринимаются направленными вправо и вниз. Для второго – когда круги кажутся наблюдателю выпуклыми полусферами. Это связано с преобладанием в повседневной жизни именно этих вариантов видения подобных объектов.

Значение отношения среднего времени восприятия преобладающего варианта видения к среднему времени восприятия альтернативного ему варианта для изображения куба Неккера схоже (достоверно не отличается) со значением отношения, рассчитанным таким же образом для изображения неоднозначно воспринимаемых затененных кругов. Это может свидетельствовать об общности механизмов восприятия неоднозначных изображений, содержащих монокулярные признаки глубины.

Была также проанализирована частота смены воспринимаемых вариантов тестовых изображений. Оказалось, что она примерно одинакова для обоих изображений и составляет в среднем 14,14 раз в минуту, несмотря на то, что переключения восприятия происходят не через равные промежутки времени – преобладающий вариант видения удерживается в течение более длительного интервала. Этот результат может быть обусловлен наличием глобальных периодических процессов, протекающих в ЦНС и лежащих в основе зрительного восприятия.

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КОМПЛИКОЛОГИЯ – СОЗДАНИЕ ТРУДНОСТЕЙ ДЛЯ ДРУГИХ СУБЪЕКТОВ: КОГНИТИВНЫЕ АСПЕКТЫ

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Большое число исследований сосредоточено на том, как люди решают задачи и справляются с проблемами и трудностями, но не на том, как и зачем они их создают. Работ по анализу создания разного рода проблем и задач несоизмеримо мало, и этот раздел надо восполнять. В качестве термина, обозначающего область изучения преднамеренного создания трудностей и проблем, мы предлагаем понятие, производное от латинского *complicatum* (“осложненное”, «путанное», «туманное»), послужившее основой для глаголов со значением «усложнять», «запутывать» в различных языках: *complicate* (англ.), *complicuer* (фр.), *complicare* (ит.), *complicar* (исп., порт.), *komplizieren* (нем.). Соответственно, мы предлагаем термин «компликология» (*complicology*). Компликология как область исследования создания трудностей, проблем, задач – это совершенно необходимая часть корпуса исследований, в который входит изучение разрешения трудностей и проблем (Поддьяков 2011).

В основные цели создания трудностей входят: а) деструктивные, связанные с нанесением ущерба; б) конструктивные, направленные на развитие того, для кого эти трудности разрабатываются (руководство физическими тренировками спортсмена, разработка систем проблемного обучения и т.п.); в) исследовательские, диагностические – узнать, как тот или иной субъект (конкретный человек, определенная возрастная группа, организация, представитель другого биологического вида) справляется с различными трудностями, решает разного рода задачи; г) игровые цели.

Отчасти пробелы в изучении преднамеренного создания трудностей восполняют: а) в области деструктивных трудностей – работы по конфликтологии, стратагемному мышлению, психологии нанесения ущерба и совершения зла; б) в области конструктивных трудностей – психолого-педагогические работы по развитию личности и мышления в ходе преодоления человеком различного рода барьеров и препятствий; б) в области диагностирующих трудностей – работы по конструированию тестовых заданий заданной трудности. Однако задача переосмысления и объединения этих подходов в целостной системе не ставилась. Попробуем продвинуться в этом направлении.

Введем некоторые понятия и формализмы.

Общий показатель конструктивности трудностей, созданных одним субъектом для другого, можно определить как различие между: а) новизной и сложностью проблем, которые субъект, для которого созданы трудности, может ставить и решать после столкновения с этими трудностями, и б) новизной и сложностью проблем, которые субъект ставил и решал до этого.

Введем абсолютный и относительный показатели конструктивности.

Абсолютный показатель конструктивности (P_d) может быть определен как разница между уровнями задач, которые субъект может решать до и после столкновения с трудностью.

$$(1) \quad P_d = N_d \gg C_d - N_d C_d$$

где: N_d и C_d – соответственно, новизна и сложность проблем, которые субъект ставил и решал до столкновения с трудностью d ; $N_d \gg$ и $C_d \gg$ – соответственно, новизна и сложность проблем, которые субъект может ставить и решать после него. (Выбор единиц измерения не обсуждаем – это отдельная тема, а пока пытаемся установить качественные соотношения.)

Если $P_d > 0$, трудность является собственно конструктивной, т.е. после столкновения с ней субъект (животное, человек, организация, государство и т.д.) может ставить и решать проблемы большей новизны и сложности, чем до этого. Если $P_d < 0$, трудность является деструктивной, т.е. после столкновения с ней субъект может ставить и решать проблемы лишь меньшей новизны и сложности, чем до этого.

Относительный показатель конструктивности (p_d):

$$(2) \quad p_d = (N_d \gg C_d - N_d C_d) / (N_d C_d) = P_d / (N_d C_d)$$

Введем понятие цены создания трудности (затраченных материальных, физиологических, интеллектуальных и др. ресурсов) для ее организатора I_{org} и цены преодоления трудности I_{rec} для реципиента (для того, для кого она создана).

Тогда эффективность организации трудности $E_{d.org}$:

$$(3) \quad E_{d.org} = P_d / I_{org}$$

Эффективность преодоления трудности:

$$(4) \quad E_{d.rec} = P_d / I_{rec}$$

Вопрос о допустимой цене создания трудности и допустимой нижней границе эффективности решается в зависимости от мировоззрения, ценностных ориентаций и целей организатора трудностей. В предельных случаях (фанатичная ненависть или же всепоглощающая альтруистическая любовь) даже за минимальный ущерб другому

субъекту (или за минимальное продвижение в его развитии) организатор трудности готов заплатить предельно высокую цену со своей стороны. В случаях «добродетельного управления» чужим развитием в сложных, противоречивых условиях приходится также решать вопрос о балансе, приемлемом соотношении конструктивных и деструктивных последствий трудностей, создаваемых изначально с конструктивными целями.

В ходе биологической эволюции и последующего культурного развития человека возникновение различных типов создания трудностей в целях управления другими субъектами (особями) происходит в следующем порядке: а) деструктивные трудности (растения могут подавлять рост других растений); б) диагностирующие трудности, подготавливающие последующее нанесение ущерба (например, пробные атаки рыб, рептилий); в) конструктивные трудности (обучение высшими животными своих детенышей через «проблемные ситуации»); г) диагностирующие трудности, подготавливающие последующую помощь (нагрузочные пробы в медицине, исходная тестовая диагностика обучаемого перед обучением и т.п.) в человеческих культурах, начиная с определенных этапов их развития. Далее в развитых человеческих сообществах возникают и развиваются деятельности по созданию

«метатрудностей», направленных на конструирование, деструкцию и диагностику деятельности по созданию конструктивных, деструктивных и диагностирующих трудностей. Появляются работы по методологии в соответствующих областях, а также социальные институты – исследовательские, учебные, управленческие организации с широчайшим диапазоном активности от обучения дошкольников математике до противодействия террористам в их исследовательской, диагностической и практической деятельности. Создание трудностей становится одним из видов универсальной оружейной деятельности человека, целью которой является воздействие на другого, обладающего самостоятельной активностью. Эта деятельность универсальна, поскольку применяется большинством субъектов по отношению к широчайшему классу объектов биологической, психологической, социальной природы с самыми разными целями. Развивающийся ландшафт социальных взаимодействий в значительной мере формируется преднамеренным и непреднамеренным созданием зон конструктивных и деструктивных трудностей, ведущих в различных эффектах развития или же его подавления.

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ВЕРБАЛЬНАЯ КАТЕГОРИЗАЦИЯ ДЕЙСТВИТЕЛЬНОСТИ В РАКУРСЕ ТЕОРИИ ПОСТРОЕНИЯ ПЕРСПЕКТИВ

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Теория построения перспектив (*vantage theory*), разработанная для объяснения особенностей категоризации цвета по аналогии с ориентированием человека в пространстве-времени (MacLaury 2002: 494), в последнее время используется для интерпретации целого ряда явлений языка и дискурса, включающих проблему лингвистической относительности; семантику цветообозначения; сочетаемость указательных местоимений и имен собственных; противопоставление русских прилагательных *невысокий* и *низкий*; функционирование артиклей в нескольких англоязычных переводах одного исходного текста; категоризацию идентичности носителей различных языков (см. Glaz, Allan 2010: 154); синонимы, обозначающие водоемы и прибрежные территории (Глаз, Потапенко 2011: 78).

Широкое применение теории построения перспектив для объяснения языковых фактов, в первую очередь, обусловлено переосмыслением понятий пространства, связываемого с покоем, и времени, соотносимого с движением (MacLaury 2002: 494). Соответственно, в наиболее общем плане категоризация действительности рассматривается как результат взаимодействия двух состояний субъекта: покоя, формирующего пространство, и движения, ассоциирующегося со временем. В свою очередь, покой и движение объясняют подобие референтов элементарному образу и отличие от него (MacLaury 2002: 494), образуя две категориальные перспективы (*vantages*): основную (*dominant*) и второстепенную (*recessive*) (MacLaury 2002: 507). Основная перспектива, соотносимая с покоем и подобием, формирует категорию благодаря отсутствию различий, фокусировке (*zooming in*), переходу от дальней позиции к вовлеченной (Glaz 2010: 261). Второстепенная перспектива, связанная с движением и различиями, состоит в уменьшении

категориальных признаков, акцентируя удаление (zooming out), несвязность элементов и их синтез в некое новое единство (Glaz 2010: 261). При формировании основной и второстепенной категориальных перспектив наблюдатель одновременно воспринимает как фигуру лишь одно отношение – подобие или отличие, соотнося другую координату с фоном, вследствие чего процесс формирования категории имеет от двух до пяти этапов (MacLaury 2002: 495).

В соответствии с вышеизложенными положениями теории построения перспектив вербальная категоризация действительности предполагает четыре основных этапа: 1) определение элементарного образа, формирующего категорию; 2) выделение характеристик, сближающих категоризируемый референт с элементарным образом, то есть установление основной перспективы (dominant vantage); 3) выявление различий между категоризируемым референтом и элементарным образом, то есть построение второстепенной перспективы (recessive vantage), имплицитующей удаление в сторону категориальной периферии; 4) воссоздание структуры соответствующей категории и анализ номинативных средств ее экспликации.

В выступлении применение теории построения перспектив для объяснения вербальной категоризации действительности рассмотрено на материале текстов о лицах, уподобляемых американскому президенту Барак Обама. Среди индивидов со сходными чертами – бывший кандидат в президенты Украины Арсений Яценюк, то есть киевский Обама, напр., *Fresh face wins reputation as Kiev's Obama* (Financial Times 7.04.2009); руководитель либеральной партии Великобритании Ник Клегг, претендовавший на пост премьер-министра, напр., *Nick Clegg declared the new Barack Obama* (Daily Telegraph 17.04.2010); итальянский губернатор, напр., *Could Puglia governor Nichi Vendola be «Italy's Obama»* (bbc.co.uk/news 13.12.2010); выходец из Гвинеи-Бисау, добивавшийся избрания на пост мэра в одном из городов Поволжья, напр., *Volgograd Obama* (The Independent 4.08.2009). Среди лиц, отличающихся от Барака Обамы: министр индийского штата Уттар Прадеш Маявати, которую либо противопоставляют американскому президенту, напр., *Why It Won't Happen: The improbability of an Indian Obama* (Times of India 19.11.2008), либо рассматривают как анти-Обаму (*India's Anti-Obama* (Newsweek 27.04.2009: 22), и один из претендентов на пост американского президента, напр., *The unlikely rise of the anti-Obama* (Newsweek 24.10.2011).

Применение теории построения перспектив к анализу текстов о лицах, сопоставляемых с Барак Обама, позволило выделить черты двух групп: общие для всех претендентов и специфические для отдельных из них. Эта дифференциация послужила базой для разграничения основной и второстепенной перспектив категории, представленной американским президентом, что позволило сделать следующие выводы. Во-первых, сопоставление отдельных лиц с американским президентом осуществляется в рамках общей категории «избранный руководитель». Ее иерархическая структура дифференцирует политиков по статусу: президентов, премьер-министров, местных руководителей, что создает возможность для сравнения с Барак Обама как кандидатов в президенты, так и претендентов на менее значимые посты. Во-вторых, учет основной и второстепенной перспектив позволяет размежевать обязательные и факультативные параметры категории «избранный руководитель» на отдельных этапах ее формирования. Вначале основная перспектива представлена характеристикой «общественный пост», отраженной во всех текстах о лицах, уподобляемых американскому президенту. На фоне параметра «избранный руководитель» следующая основная категориальная перспектива соотносится с идеей изменения, которое характеризует всех претендентов и обозначается либо существительным *change*, либо единицами, имплицитующими преобразования, например, изменения в настроениях избирателей. В-третьих, все другие параметры – цвет кожи, возраст, быстрое продвижение вверх, владение английским языком, контакт с командой президента – соотносятся со второстепенной перспективой, характеризующей отдельных лиц.

Таким образом, использование теории построения перспектив, с одной стороны, позволяет установить закономерности уподобления американскому президенту различных лиц, а с другой стороны, свидетельствует о ее применимости для интерпретации номинативных средств, представляющих одно явление в разных ракурсах.

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ОБРАЗ ПСИХИЧЕСКОГО СОСТОЯНИЯ: МЕХАНИЗМЫ И ЗАКОНОМЕРНОСТИ

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Изучение отношений между категориями психических явлений является важнейшей методологической проблемой психологии. Установление зависимостей между «сознанием» и «состоянием» позволило бы, с одной стороны, показать «вклад сознания» в состояние и объяснить ментальные механизмы регулирования – возникновение состояний определенной модальности, знака, длительности, интенсивности, их динамику и устойчивость, а с другой, – выявить особенности влияния психического состояния на составляющие сознания и его структуры, их содержание и изменения в процессе взаимоотношений.

В этом контексте фундаментальное значение приобретает изучение бытийного слоя сознания: «чувственной ткани» (по А. Н. Леонтьеву) – образа психического состояния. При изучении образа мы исходим из следующих представлений. Образ состояния, в отличие от предметного образа, может рассматриваться как структура, в которой слиты воедино знание, переживание и отношение, где знание раскрывается на основе консолидации внутренних ощущений и субъективного опыта, переживание связано с осознанностью и рефлексивностью, а отношение выражает зависимость образа состояния от ситуаций его возникновения, с одной стороны, и влияние образа состояния на регуляторные процессы жизнедеятельности субъекта, с другой.

На наш взгляд, образ психического состояния связан с сенсорно-перцептивными процессами (впечатлением, ощущением, восприятием), со структурами субъективного опыта вкупе с представлениями (вторичными образами) и памятью, а также с переживаниями и рефлексией. Именно в переживании, на основе ощущений и рефлексии, субъекту дается реальность его психического состояния. Переживание определяет и закрепляет психический образ состояния, интенсивность (яркость) его проявления, тогда как рефлексия устанавливает границы образа, его близость и соответствие актуально переживаемому состоянию.

В соответствии с этими представлениями, механизмы, приводящие к возникновению и закреплению образа психического состояния, следующие. Внутренние ощущения и впечатления,

вызванные событиями и ситуациями, переживаемыми субъектом, проходя этап сличения с содержанием прошлого опыта, превращаются в представления о пережитом состоянии, и далее, через процесс осознания в его образ. Подобно тому, как возникает и закрепляется предметный образ в процессе восприятия, образ психического состояния фиксируется и закрепляется в структурах памяти во время переживания индивидом данного состояния, формируя субъективный опыт.

В дальнейшем образ может репродуцироваться в актуальных ситуациях жизнедеятельности в форме представления, то есть образа памяти, хранящегося в субъективном опыте. Данный образ не является предметным, это чувственный образ, формируемый переживанием. Он, в свою очередь, как и образ представления, может обогащаться и изменяться в процессе жизнедеятельности.

Субъективный образ психического состояния раскрывается в трех проекциях: прошлое (в представлении о состоянии), настоящее (образ актуального состояния, возникающий вследствие восприятия собственного состояния «здесь и сейчас») и будущее (образ будущего, например, желаемого состояния). Образ состояния характеризуется определенным строем, связанным с отношениями между составляющими образа, схемой, представляющей собой форму когнитивного образования, объединяющей и отражающей пространственно-временные и функциональные отношения между составляющими состояния, а также иерархической организацией, структурой, интенсивностью, качеством, модальностью и функциональностью. Он относительно стабилен, в его структуре существуют как постоянные, так и вариативные составляющие.

Содержание образа представляет собой результат отражения накопленного опыта переживания данного состояния при различных обстоятельствах, ситуациях и событиях, в которых находился субъект, и связано с его впечатлениями, рефлексивными процессами, особенностями переживания и др. Отраженные компоненты психического состояния фиксируются в сознании в определенном сочетании, формируя структуру. Последняя изоморфна реальному состоянию. Опыт проецируется на актуальное собственное состояние. Субъектом воспринимаются характеристики состояния со стороны поведенческих, психологических,

физиологических и др. показателей, придаётся форма этому разнообразию, формируется образ состояния, определяется качество. Субъект структурирует пространство состояния, создается система отсчёта (ориентиры), т.к. пространство только тогда и есть, когда оно структурировано. Появляется мера. Движение по «собственной шкале» дает возможность субъекту оценить пространство состояния, что субъективно выражается в качественной определенности тех или иных составляющих, входящих в состояние при переживании интенсивности их проявления. Переживание длительности («длени») и изменения психического состояния создает временной ряд образа, включающий в себя различные характеристики (временные интервалы, последовательность, длительность, дискретность, циклы и пр.). Задачей ряда является синхронизация деятельности субъекта, событий и ситуаций, пространства, переживаний и др., в том числе, интеграция пространственных характеристик (параметров состояния) в единое образование – образ состояния.

Взаимодействие ситуации (события), субъективного опыта, когнитивных процессов при опосредованном влиянии переживания, осознания и рефлексии приводит к формированию корреляционных образований («конstellаций» – по Б.Г. Ананьеву) из отдельных «ведущих» составляющих психологических структур. Корреляции изменяют переживание, поведение, психические функции, вегетативные реакции, физиологические и пр. процессы субъекта. Эти

изменения объективируются в сознании в виде образа психического состояния.

Проведенные в контексте данной теоретической модели исследования образа психического состояния позволили выявить ряд особенностей: характеристики пространственно-временной организации, специфику и интенсивность проявления, вариативность показателей, рельефы, изменения структурных характеристик во временных диапазонах, организованность и устойчивость связей внутри структур образов. Установлено, что образы психических состояний при их достаточной устойчивости и стабильности характеризуются тенденцией к изменению с увеличением временных диапазонов при сохранении субъективной идентификации состояния. Образы психических состояний в прошлом, настоящем и будущем связаны и зависят от свойств личности. Причем состояния высокой и низкой психической активности в большей степени, по сравнению с равновесными состояниями, обусловлены свойствами личности и когнитивными процессами. Выявлены типичные картины временных характеристик образов психических состояний, обусловленные влиянием свойств личности. В наибольшей степени типичные картины образов состояний зависят от социального интеллекта, «интроверсии–экстраверсии», «эмоциональной стабильности – нестабильности», «подчиненности–доминантности».

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НАРУШЕНИЯ ЗРИТЕЛЬНО-МОТОРНОЙ КООРДИНАЦИИ ПРИ УМСТВЕННОМ УТОМЛЕНИИ И ЕЕ ВОССТАНОВЛЕНИЕ ПОСЛЕ КОРОТКОГО ДНЕВНОГО СНА

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При продолжительном выполнении работы, связанной с повышенной умственной нагрузкой, развивается состояние умственного утомления. Оно характеризуется сниженной работоспособностью и повышенным риском совершения ошибок. В связи с этим возникает важная задача мониторинга состояния оператора с целью предупреждения о развитии умственного утомления, при котором нарушается выполнение ответственных заданий.

Кроме того, важен вопрос восстановления работоспособности и оптимальной стратегии отдыха. В связи с этим необходимо сравнение дневного сна и спокойного бодрствования как способов восстановления исходного состояния оператора.

Данная работа посвящена проблеме, набирающей свою актуальность в том числе и в социальном аспекте, и сочетает в себе различные подходы к ее исследованию. Она изучает сложный психофизиологический феномен умственного утомления и его проявления в двигательной активности человека. Кроме того, она рассматривает взаимодействие и взаимное влияние процессов утомления и сна.

В настоящее время для исследования умственного утомления наиболее перспективна технология бесконтактной видеорегистрации движений глаз (eye-tracking). Данная методика широко используется, например, в исследовании когнитивных процессов и позволяет с высокой точностью отслеживать параметры перемещения взгляда оператора, не вмешиваясь в его работу.

Нами была разработана методика моделирования умственного утомления в лабораторных условиях, позволяющая непрерывно регистрировать движения глаз и рук оператора. В наших экспериментах испытуемые непрерывно выполняли психофизиологический тест, вызывающий средний уровень умственного утомления. Согласно инструкции, испытуемые с максимальной скоростью и точностью решали появляющиеся на экране компьютера арифметические задачи. После вычисления ответа требовалось щелкнуть мышью по примеру и выбрать правильный ответ из двух появившихся на экране, путем щелчка мышью по правильному ответу. Траектория движения взгляда испытуемого регистрировалась с помощью системы видеотрекинга (Eyegaze Development System, LC Technologies, USA), параллельно шла запись движений курсора мыши и ЭЭГ. Такая схема позволяла анализировать динамику изменения показателей координации зрительной и моторной систем, вызываемых умственным утомлением.

После выполнения первой рабочей сессии, вызывающей умственное утомление, испытуемый отдыхал 1 час, а затем: 1) в основной серии имел возможность уснуть в течение одного часа, 2) а в контрольной серии – бодрствовал. Дизайн эксперимента был рассчитан таким образом, чтобы время отдыха приходилось на пик дневной сонливости (около 15:00).

Во время сна записывалась полисомнограмма, что позволило исследовать параметры

дневного сна. Через 1 час отдыха испытуемый вновь выполнял задание (вторая сессия) для сравнения эффективности восстановления работоспособности после сна или бодрствования.

В результате проведенных пилотных исследований было показано, что оператор может поддерживать эффективность работы на стабильном уровне, однако в связи с недостаточным уровнем утомления заметных изменений в параметрах движений глаз не произошло. Тем не менее, умственное утомление сказывалось на последующей деятельности, а степень восстановления зависела от типа отдыха. После часа спокойного бодрствования скорость работы постепенно снижалась, в то время как после сна работоспособность восстанавливалась и не снижалась в ходе второй сессии. Предварительные результаты были представлены на конференциях (Пучкова и др., 2011, Puchkova A. N. et al., 2011). После проведения пилотных исследований методика была модифицирована для получения более выраженного умственного утомления.

Развитие данного подхода может способствовать в создании бесконтактного метода диагностики умственного утомления и выбора оптимальной стратегии восстановления работоспособности.

Работа выполнена при поддержке Российского гуманитарного научного Фонда (проект № 11–36–00242a1), и фонда Президиума РАН «Фундаментальные науки – медицине».

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РЕДУЦИРОВАННЫЕ РЕАЛИЗАЦИИ В РУССКОЙ РЕЧИ: СЛУЧАЙНОСТЬ ИЛИ ЗАКОНОМЕРНОСТЬ?

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В неподготовленной речи фонетический облик значительной части словоформ подвергается редукции вследствие выпадения одного или нескольких звуков. Неполнота речевого сигнала не является причиной

коммуникативных неудач при естественном общении, однако существенно затрудняет автоматическое распознавание речи. В докладе описывается исследование, направленное на поиск закономерностей возникновения редуцированных реализаций в речи носителей русского языка, которое должно позволить лучше понять механизмы порождения речи и оценить возможность их использования при

машинном моделировании процессов речевой деятельности.

В ряде работ (Bybee 1994, Probabilistic Relations...2000, Богданова 2010 и др.) отмечается, что в редуцированном виде в речи встречаются прежде всего высокочастотные словоформы. Для проверки этого предположения на основе анализа словарей высокочастотных слов русской разговорной речи (Земская 2006 (1979): 208–209, Фонетика спонтанной речи 1988: 240–245) и фонетических исследований по теме (Александров, Гельман 1986, Касаткина 2007, Богданова 2010) был сформирован список, состоящий из 18 высокочастотных словоформ.

Были проанализированы все реализации отобранных словоформ, встретившиеся в аудиозаписях неподготовленной русской речи, общей продолжительностью звучания 4 часа 50 минут.

В целом соотношение полных и редуцированных вариантов для проанализированных словоформ оказалось неодинаковым. Так, восемь высокочастотных словоформ имеют тенденцию к употреблению в нередуцированном виде; редуцированные реализации других восьми словоформ встречаются чаще, чем полные; для двух словоформ количество единиц, не подвергшихся изменению, совпадает с количеством редуцированных форм.

Некоторые высокочастотные словоформы имеют типичную редуцированную реализацию, например: [to+k*]¹, [mn'a+], [k*da+], [t'a], [t'e] и т.д. для словоформ *только, меня, когда, тебя, тебе* соответственно. Редуцированный вариант [s': as] для словоформы *сейчас* оказался более частотным, чем полный. По-видимому, эти редуцированные реализации, в силу их высокой частотности, могут храниться в ментальном лексиконе наряду с полными формами и автоматически извлекаться из него при порождении и восприятии речи.

В ходе дальнейшего анализа оценивалось, существует ли зависимость появления редуцированных реализаций от фразовой позиции, в которой находится словоформа. Сравнивалось количество полных и редуцированных реализаций в начале, середине и конце синтагмы (т.е. части устного высказывания, расположенной между паузами в речи говорящего). Кроме того, отмечались те случаи, когда реализация является самостоятельной синтагмой, т.е. отделена

паузами и от предшествующего, и от последующего контекста.

Реализации словоформ *несколько* и *совсем* встретились только в одной позиции и далее не анализируются.

Анализ доверительных интервалов для представленных значений показал, что в середине синтагмы редуцированные реализации словоформ *тебе, себя, меня* и *сейчас* достоверно чаще употребляются в редуцированном виде, а словоформы *только* и *меня* – в нередуцированном.

Реализации словоформ *несколько, себя, говорит, говорю* и *совсем* ни разу не встретились в редуцированном виде в начале синтагмы; словоформы *несколько, тебе, тогда* и *когда* не представлены редуцированными вариантами в конце синтагмы. Других закономерностей употребления проанализированных словоформ в полном или редуцированном виде в начале и конце синтагмы выявлено не было.

Представленные результаты не позволяют однозначно предсказать, будет ли редуцирована высокочастотная словоформа в той или иной позиции. Однако сделанные наблюдения свидетельствуют о том, что наиболее слабой позицией является середина синтагмы: именно в этой позиции высокочастотные словоформы подвергаются редукции чаще всего. Сведения же о типичных реализациях и о том, что некоторые словоформы не могут быть употреблены в редуцированном виде в какой-либо из позиций, по-видимому, используются слушающим при распознавании естественного речевого сигнала и, следовательно, должны учитываться при создании систем автоматического распознавания речи.

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¹ Знак «+» указывает на ударность предшествующего гласного; знаком «*» обозначаются безударные аллофоны гласных, следующих за твёрдыми согласными.

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КРЕАТИВНОСТЬ И ОСОБЕННОСТИ ПОЛУШАРНОЙ СЕЛЕКЦИИ ИНФОРМАЦИИ: ЗНАЧЕНИЕ ИНТЕЛЛЕКТА

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Выбор нового оригинального решения проблемы требует отказа от фиксации на хорошо известном варианте и перехода к поиску других идей. Функции торможения irrelevantной информации и детекции ошибок выполняют системы мозга, исполнительное звено которых локализовано в лобных отделах как левого, так и правого полушарий мозга. Однако в соответствии с моделью «Geneplore» (Finke et al., 1992), ключевая роль в выборе оригинального решения задачи принадлежит левому полушарию, доминирующему в ходе проверки гипотез, возникающих как результат логичных рассуждений и оценивания разных вариантов решений. С другой стороны, мета-анализ особенностей функциональной асимметрии полушарий, связанных с креативностью, указывает на доминирование правого полушария (Mihov et al., 2010). Такие противоречия в выводах о взаимосвязи креативности и полушарной асимметрии могут быть обусловлены тем, какая именно проблема (вербальной или образной природы) и какая стратегия поиска ее решения выходит на передний план. При спонтанном, «инсайтном» поиске идеи большее значение приобретает правое полушарие, так как именно ему принадлежит приоритет в формировании отдаленных ассоциаций и необычных связей объектов. В случае склонности к критическому перебору множества альтернатив приоритет, напротив, смещается в сторону левого полушария. Объем знаний, скорость мышления и степень использования логики или интуиции при генерации идей, их критики и отвержения или приемлемости формируют большое разнообразие индивидуальных стратегий решения креативных проблем.

На основе анализа результатов, полученных при изучении связанных с креативностью

закономерностей функциональной активности мозга, и закона ЭУС (этапы – уровни – ступени) Я. А. Пономарева, нами было предложено новое содержание этой модели как континуума активационных состояний коры и особенностей селективных процессов, определяющих разнообразие стратегий творческой деятельности (рисунок) (Разумникова, 2009). Задачей настоящего исследования стало выяснение полушарной специфики в связанной с креативностью селекцией образной или вербальной информации с учетом вклада интеллекта, уровень которого в соответствии с гипотезой «нейронной эффективности» может определять субъективную легкость решения экспериментального задания. Для изучения полушарных особенностей селективных процессов была использована парадигма «глобального»-«локального» внимания Навона в ее русскоязычной версии с латерализованным предъявлением иерархически организованных букв в ситуациях их опознания или сравнения (Разумникова, Вольф, 2010).

Вклад в оригинальность творческого мышления компонентов интеллекта и внимания оценивали методом множественной регрессии. Было установлено, что вне зависимости от типа креативного мышления предикторами его оригинальности являются высокая скорость правополушарных селективных процессов на глобальном уровне, но их замедление при обмене информацией между полушариями. Успешность каждого типа креативного мышления, вербального или образного, может обеспечиваться разными стратегиями обработки информации: и глобальными, и локальными, что отражает эффективность специализации полушарий в селекции информации (на локальном уровне – левого и на глобальном – правого). Причем для вербальной оригинальности большее значение имеет левополушарная скорость опознания иерархических вербальных стимулов на локальном уровне, а для образной – показатель успешности этого процесса.

В случае учета вклада интеллекта во взаимосвязи креативности и особенностей внимания

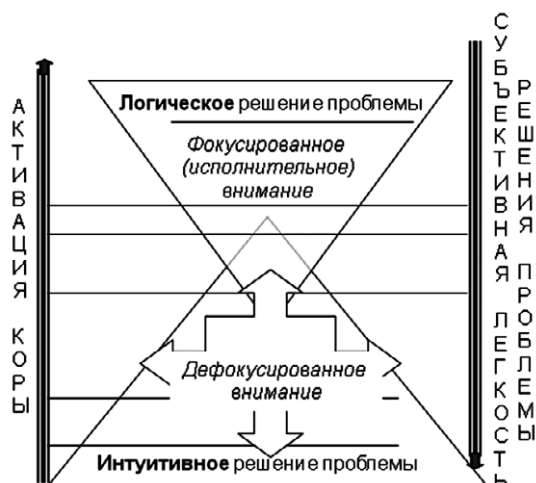


Рисунок 1. Схема соотношения активационных состояний коры и особенностей селективных процессов, обеспечивающих разные стратегии креативного мышления

оригинальность вербального мышления наряду с полушарной специализацией селективных процессов: быстрой обработкой сигналов на локальном уровне левым и на глобальном — правым полушарием, при использовании образного компонента интеллекта требует замедления обмена информацией между полушариями, а при учете вербального — правополушарного торможения — в опознании локальных свойств стимулов и быстрой селекции информации на глобальном уровне в обоих полушариях. Предикторами образной креативности стали высокий интеллект (вне зависимости от его природы: образной или вербальной) и быстрая правополушарная

обработка стимулов на глобальном уровне как при опознании информации, так и при ее сравнении, а также замедление обмена информацией между полушариями. Согласно коэффициенту детерминации в полученных уравнениях множественной регрессии, для образной оригинальности показатели внимания и интеллекта имеют меньшее значение, чем при описании оригинальности составленных предложений.

Таким образом, вклад интеллекта и функций левого полушария и селективных процессов на локальном уровне в большей степени выражен при поиске оригинального решения вербальной задачи, чем образной. Это указывает на большее значение фокусированного исполнительного внимания для вербальной креативности, тогда как дефокусированное внимание преобладает при поиске оригинального образа. Разные формы обнаруженных взаимосвязей креативности, интеллекта и характеристик внимания свидетельствуют о широком репертуаре индивидуальных стратегий достижения творческой продуктивности с вовлечением функций как правого, так и левого полушарий.

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ИНТЕРНЕТ-ЗАВИСИМОСТЬ КАК ОТРАЖЕНИЕ ПСИХОЛОГИЧЕСКИХ ПРОБЛЕМ ЧЕЛОВЕКА

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Интернет-зависимость характеризуется навязчивым желанием подключиться к Интернету и болезненной неспособностью вовремя от него отключиться. При этом люди настолько предпочитают жизнь в Интернете, что фактически начинают отказываться от своей «реальной» жизни, проводя до 18 часов в день в виртуальной реальности. (Жичкина; Surratt С. 1999)

В настоящее время зависимость от сетевого пространства встречается у людей, особенно молодых, настолько часто, что становится серьезной социально-психологической проблемой. Компьютерную зависимость чаще всего осознают окружающие человека друзья, родственники, знакомые, но отнюдь не он сам, что очень схоже с любым другими видами зависимости (алкоголь, наркотики). Проблему пытаются «разрешить» простейшим способом — ограничив время пользования компьютером. Но, как правило, ситуация только усугубляется. Для снятия и предупреждения компьютерной и сетевой зависимости необходим психологический анализ причин ее форми-

Группа	Уровень Интернет- зависимости	Уровень депрессии	Тест уверенности в себе		Уровень субъективного контроля
			Уверенность в себе	Социальная смелость	Общая интернальность
Склонные к зависимости	4,4	5,1	3,1	3,3	3,6
Независимые	1,3	3,6	6,7	6,8	5,6

Таблица 1. Средние показатели шкал в двух группах.

рования. (Бабаева с соавт. 2000, Войскунский 2004, Davis 2002).

Мы исследовали, как склонность к Интернет-зависимости связана с индивидуально-личностными особенностями человека. В качестве испытуемых были привлечены 30 девушек в возрасте от 20 до 24 лет, профессия которых предполагала ежедневное пользование Интернетом. Были использованы следующие опросники:

1. Опросник «Поведение в Интернете» А. Жичкиной (Жичкина)
2. Шкала депрессии НИИ им. Бехтерева (Практическая... 2009)
3. Тест уверенности В.Г. Ромека (Ромек 2008)
4. Опросник уровня субъективного контроля. (Практическая... 2009)

Была проведена статистическая обработка результатов: различия средних по критерию Стьюдента и корреляционный анализ по методу ранговой корреляции Спирмена с помощью Microsoft Excel.

По результатам опросника «Поведение в Интернете» А. Жичкиной были выделены две группы: с высоким и низким уровнем Интернет-зависимости (18 и 22 человека соответственно). В таблице 1 приведены средние значения показателей из всех опросников, которые статистически значимо различались для этих групп ($p \leq 0,01$). По остальным показателям различий между группами не было выявлено.

У группы девушек, склонных к Интернет-зависимости, был выявлен повышенный уровень депрессии, низкий уровень субъективного контроля по шкале общей интернальности (что соответствует экстеральному типу личности), низкий уровень социальной смелости и уверенности в себе. У группы девушек, не проявивших Интернет-зависимости, наоборот, низкий уровень депрессии, высокий уровень субъективного контроля по шкале общей интернальности (что соответствует интернальному типу личности),

высокий уровень социальной смелости и уверенности в себе.

Указанные связи уровня Интернет-зависимости с личностными особенностями показал и статистический анализ методом ранговой корреляции Спирмена, который позволяет определить тесноту (силу) и направление корреляционной связи между двумя признаками, с помощью которого выявляется направление изменения одного показателя при изменении другого. Была выявлена закономерность – чем выше уровень Интернет-зависимости, тем ниже показатели: субъективного контроля по шкале общей интернальности ($r = -0,56$), уверенности в себе ($r = -0,74$) и социальной смелости ($r = -0,51$), и тем выше показатели уровня депрессии ($r = 0,78$). Таким образом, чем сильнее наша испытуемая была зависима от Интернета, тем она была депрессивнее, более социально робка и экстернальна и менее уверена в себе.

Приведенные результаты дают основание для понимания Интернет-зависимости не как самостоятельного явления, а как следствия более глубоких внутриличностных и межличностных проблем.

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ТОНКИЙ ЗАПАХ, НЕЖНЫЙ ВКУС: О ЛИНГВИСТИЧЕСКОЙ ИЕРАРХИИ ПЕРЦЕПТИВНЫХ КАНАЛОВ

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Сенсорные системы человека, обеспечивающие восприятие информации о внешней среде, — зрительная, слуховая, обонятельная, осязательная и вкусовая — обнаруживают в своем устройстве и функционировании целый ряд сходных черт. На лингвистическом уровне это проявляется в том, что разные типы перцептивных процессов или признаков могут в языке объединяться в одной лексеме (ср. в русском *слышать* о восприятии звуков и запахов).

Очевидно, что полисемия такого рода возникает в результате метафорических переносов с одного вида перцепции на другой. При этом, как показано на широком типологическом материале в известной работе Viberg 1983 (ср. тж. Williams 1976, Evans, Wilkins 2000), подобные семантические переходы подчиняются следующей иерархии: зрение > слух > осязание > вкус/обоняние. Таким образом, зрение для языкового сознания оказывается более значимым, чем остальные сенсорные модальности, и соответственно, глаголы зрительного восприятия могут метафорически распространиться на другие типы перцепции, тогда как обратное невозможно.

Между тем, в работах последних лет универсальность иерархии О. Виберга была поставлена под сомнение. Данные ряда «экзотических» языков свидетельствуют о том, что семантическая эволюция иногда происходит в противоположном направлении. Так, во многих койсанских языках первичными для разных перцептивных значений выступают лексемы с семантикой вкуса (Nakagawa 2007), в колымском юкагирском значение глагола «видеть» вторично по отношению к «слышать» (Maslova 2004). Можно было бы предположить, что нарушение иерархии лингвоспецифично, т.е. обусловлено культурной значимостью определенной семантической зоны в узком языковом ареале (так, для койсанских языков характерна чрезвычайно детальная — насчитывающая многие десятки единиц — система выражения вкусовых ощу-

щений, что подтверждает важность этого канала восприятия в данной культуре).

Однако лингвистический материал, который мы рассмотрим в настоящем исследовании, свидетельствует о том, что нарушения шкалы сенсорных модальностей носят гораздо более массовый характер, чем предполагалось ранее. Основу нашего анализа составили примеры из разработанной нами Базы данных по семантическим переходам в русской признаковой лексике (см. Карпова и др. 2010). База включает информацию о 250 частотных многозначных качественных прилагательных и соответствующих им наречиях и среди прочего учитывает таксономический класс, к которому относится каждое отдельное значение признакового слова.

В Базе данных имеются, с одной стороны, переходы, согласующиеся с иерархией О. Виберга, например:

- осязание → вкус, ср. *нежная кожа* → *нежный вкус*;
- зрение → вкус, ср. *яркий цвет* → *яркое звучание*;
- зрение → обоняние, ср. *тонкий слой* → *тонкий аромат*.

С другой стороны, в Базе обнаруживается немало моделей, которые противоречат описанной Вибергом шкале:

- осязание → слух, ср. *острый нож* → *острый визг*;
- осязание → зрение, ср. *тупой нож* → *тупой носок (ботинка)*;
- вкус → слух, ср. *сладкий чай* → *сладкий голос*.

Материал русского языка находит немало типологических параллелей. Например, лексико-типологический анализ семантической зоны «острый» выявляет следующие модели переходов:

- осязание → слух:
 - англ. *sharp knife* ‘острый нож’ → *sharp cry (of fear)* букв. ‘острый крик (страха)’ (= ‘резкий’);
 - франц. *lance aiguë* ‘острое копье’ → *une voix aiguë* букв. ‘острый голос’ (= ‘высокий’).
- осязание → зрение:
 - финск. *terävä veitsi* ‘острый нож’ → *terävä parta* букв. ‘острая бородка’;
 - сербск. *oštar nož* ‘острый нож’ → *oštar nos* букв. ‘острый нос’.

Таким образом, примеры, отражающие семантические сдвиги от правых к левым точкам

на шкале сенсорных модальностей, довольно многочисленны. Этот факт говорит о том, что, по-видимому, разные типы восприятия в сознании человека находятся в тесном взаимодействии и взаимопроникновении, т.е. перцептивные возможности в зеркале языка предстают, скорее, как своего рода сообщающиеся сосуды, чем как жестко структурированная иерархия.

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ЗАДЕЛЫ ИССЛЕДОВАНИЙ КОГНИТИВНОЙ ЭВОЛЮЦИИ

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Ключевая проблема. По-видимому, наиболее глубокие когнитивные процессы – это процессы научного познания. Но способен ли человек познавать природу? Почему формальный логический вывод, сделанный человеком, применим к реальным объектам в природе? Рассмотрим, например, физику, одну из фундаментальных естественнонаучных дисциплин. Мощь физики связана с эффективным использованием математики. Но математик делает логические выводы, доказывает теоремы независимо от внешнего мира, используя свое мышление. Почему же эти выводы применимы к реальной природе?

Как моделировать когнитивную эволюцию. Естественный подход к анализу проблемы – построение математических и компьютерных моделей когнитивной эволюции (эволюции познавательных способностей биологических организмов), осмысление с помощью моделей эволюционного происхождения логического мышления человека, используемого в научном познании, в математических доказательствах (Редько, 2008).

Приведем пункты, соответствующие последовательным этапам будущего моделирования когнитивной эволюции.

- Изучение адаптивного поведения модельных организмов с несколькими естественными потребностями: питание, размножение, безопасность.

- Исследование перехода от физического уровня обработки информации в нервной системе животных к уровню обобщенных образов, аналогов слов.

- Изучение процессов формирования причинной связи в памяти животных. Анализ роли прогнозов в адаптивном поведении.

- Моделирование «логических выводов» при поведении животных. Сопоставление логики поведения животных с логикой математических доказательств.

Начальные шаги. С учетом этих этапов были построены начальные модели. Эти модели включали: 1) компьютерную модель автономных агентов (модельных организмов), которые могут самостоятельно формировать цепочки последовательных действий и понятия, обобщающие сенсорную информацию (Бесхлебнова, Редько, 2010), и 2) модель автономных агентов, обладающих естественными для живых организмов потребностями: питание, размножение, безопасность (Red'ko, Koval', 2011). Эти начальные модели – определенный задел исследований когнитивной эволюции. Помимо этого, заделом являются и работы в ряде научных направлений. Охарактеризуем эти исследования.

Направление исследований «Адаптивное поведение». Это направление сформировалось в начале 1990-х годов (Meyer, Wilson, 1991). Основной подход этих исследований – конструирование и изучение искусственных «организмов» (в виде компьютерной программы или робота), способных приспосабливаться к внешней среде. Исследователи адаптивного поведения разрабатывают такие модели, которые применимы к описанию поведения как реального животного, так и искусственного модельного организма. Дальняя цель этих работ – анализ эволюции когнитивных способностей животных в контексте происхождения интеллекта человека – близка к задаче моделирования когнитивной эволюции.

Исследования когнитивных архитектур.

Под когнитивными архитектурами понимаются структура и принципы функционирования познающих систем, которые можно использовать в искусственном интеллекте. Пример когнитивной архитектуры – система Soar (от англ. State, Operator And Result). Soar – это основанная на символьных представлениях достаточно общая когнитивная архитектура развивающихся систем, которая обладает свойствами интеллектуального поведения. Основная цель работ по Soar – создание системы функционирования интеллектуальных агентов, работающих в широкой области: от простейших форм до оперирования в сложных, заранее не предсказуемых условиях. Систему Soar предложили специалисты в области искусственного интеллекта еще в 1980 годах, тогда ее инициировали как попытку построить унифицированную теорию познания. Обзор этих исследований содержится в работе (Lehman, Laird, Rosenbloom, 2006).

Интеллектуальные автономные агенты.

Это близкое к когнитивным архитектурам направление исследований, в котором большое внимание уделяется биологически обоснованным автономным агентам и компьютерным моделям агентов. Обзор исследований в этой области содержится в работе (Vernon, Metta, Sandini, 2007). Очерченные выше начальные шаги характеризуют элементарные когнитивные свойства автономных агентов.

На пути к интеллекту человеческого уровня. На нескольких международных конгрессах по вычислительному интеллекту (World Congress on Computational Intelligence, Ванкувер, 2006; Гонконг, 2008) проводились представительные дискуссии по подходам к моделированию и возможному созданию интеллектуальных систем человеческого уровня.

Связь с основаниями математики. Выше заострялся вопрос о причинах применения математических доказательств к познанию реальных объектов в природе. Данный вопрос связан с обоснованием методов математического вывода и с возможностью пересмотра оснований математики. Именно в этом контексте в работе (Turchin, 1987) был предложен подход к введению предиктивных логических правил, позволяющих предсказывать будущие ситуации.

Выводы. Таким образом, со стороны нескольких дисциплин формируются подходы к построению и изучению моделей когнитивных, интеллектуальных агентов. Этот задел целесообразно использовать при исследовании когнитивной эволюции.

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КОГНИТИВНЫЕ ОСОБЕННОСТИ ДОШКОЛЬНИКОВ С ВЫРАЖЕННЫМИ СПОСОБНОСТЯМИ К ПРОГРАММИРОВАНИЮ

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Усиливающийся в последние годы интерес к выявлению когнитивных факторов, лежащих в основе способностей к программированию (Бабаева, Войскунский, 2003), объясняется

рядом причин. Для создания крайне востребованных в наши дни программных систем и сред, баз данных и обучающих симуляторов необходимы талантливые разработчики и программисты. В их поиске заинтересованы крупные корпорации и научные институты. Широкую популярность приобрела идея, озвученная на семинаре в Открытом Университете «Сколково», о создании школ и классов, в которых учащиеся смогут получить профильное образование в

области компьютерной инженерии и информатики. Их организация предполагает разработку диагностических методов, направленных на выявление одаренных детей в сфере информационных технологий (ИТ). Не менее остро стоит вопрос создания специальных образовательных программ для таких школ, а также повышения эффективности обучения программированию в школах и вузах. Далеко не все выпускники школ, овладевающие специальностями в сфере ИТ, могут успешно пройти курс обучения. Профессор отделения компьютерных наук Калифорнийского университета Ф. Грюнбергер еще в 70-х гг. прошлого века отметил, что только 2 студента из 100, слушающих вводные курсы программирования, «попадают в резонанс» с предметом и, по-видимому, оказываются прирожденными программистами.

Необходимость решения перечисленных задач объясняет повышенное внимание специалистов (программистов, преподавателей, психологов, руководителей информационно-технологических компаний и др.) к проблемам изучения одаренности в области программирования. Какие когнитивные особенности влияют на успешность обучения программированию, почему одни дети схватывают материал буквально на лету, а другие не способны освоить даже азы программирования, можно ли выявить перспективных детей, которые в будущем смогут эффективно работать в сфере ИТ? Эти вопросы нуждаются в серьезном обсуждении. Дискуссионной является гипотеза о влиянии уровня интеллекта на успешность обучения программированию. Одни авторы связывают эту успешность с высоким коэффициентом интеллекта (IQ), другие – с наличием особого, алгоритмического типа мышления.

Большинство исследований в указанной области проводилось со взрослыми – студентами и специалистами, однако не меньший интерес вызывает анализ когнитивных особенностей детей школьного и дошкольного возраста. Действительно, чем раньше у ребенка будут выявлены способности к программированию, тем больше у него шансов получить необходимые знания и опыт на специально созданных для одаренных детей курсах и сознательно подойти к выбору своей дальнейшей образовательной траектории.

Цель исследования: выявление и анализ когнитивных особенностей старших дошкольников с выраженными способностями к программированию.

Гипотеза: успешность обучения дошкольников программированию связана с

особенностями развития алгоритмического мышления.

Испытуемые: 66 дошкольников, посещающих детский сад № 1511 г. Москвы. Из них: 25 человек из старшей группы (5,5–6 лет) и 41 – из подготовительной, состоящей из 6–7-летних детей, которым на следующий год предстояло идти в школу.

Обучающая программная среда. Для выявления детей, проявляющих способности в области программирования, необходимо было провести с ними учебный курс, направленный на освоение базовых концепций программирования. Такой курс был разработан И.Б. Рогожкиной в сотрудничестве с А.Г. Кушниренко (Rogozhkina, Kushnirenko, 2011). Мы использовали программную среду Пиктомир (<http://www.piktomir.ru/>), в которой с помощью пиктограмм дети могут собрать на экране компьютера несложную программу, управляющую виртуальным Роботом. Курс состоял из 8 занятий, которые проводились по подгруппам, состоящим из 6 человек. На первых занятиях дошкольники создавали линейные программы. Оставшиеся занятия были посвящены введению циклов и подпрограмм.

Методика. Уровень интеллекта оценивался с помощью «Цветных прогрессивных матриц» Дж. Равена и методики диагностики умственного развития дошкольников, созданной под руководством Л.А. Венгера. Помимо этого, воспитатели детского сада, ведущие занятия по математике и конструированию, оценивали способности детей к математике и пространственной визуализации. Для определения уровня освоения дошкольниками учебного материала была разработана авторская методика (Рогожкина, Бабаева, 2011), позволяющая дифференцировать три уровня способностей к программированию: выше среднего, средний и ниже среднего. Также детям было предложено выполнить несколько алгоритмов, записанных с помощью блок-схем.

Результаты. Только 20% детей из старшей группы научились использовать циклы и подпрограммы. Им потребовалось больше занятий и упражнений для того, чтобы научиться создавать линейные программы. В подготовительной группе (6–7 лет) все дети в той или иной степени освоили изучаемые понятия. Поэтому для выявления когнитивных факторов, связанных со способностями к программированию, использовались результаты только этой группы. Обнаружена значимая корреляционная связь (по Пирсону) между способностями к программированию и следующими показателями: умением

выполнять алгоритмы, записанные с помощью блок-схем ($r = 0.709$, $p < 0.01$); умением выполнять набор простых инструкций ($r = 0.586$, $p < 0.01$), уровнями интеллекта по Равену ($r = 0.514$, $p < 0.01$) и по Венгеру ($r = 0.337$, $p < 0.05$), способностями к математике ($r = 0.347$, $p < 0.05$). Наибольший интерес представлял сравнительный анализ следующих двух подгрупп. В первой высокий уровень интеллекта и математических способностей сочетался с низкой или средней успешностью в курсе программирования, а также в выполнении набора простых инструкций и алгоритмов. Во второй наблюдалась обратная картина.

Выводы: Полученные данные свидетельствуют о наличии оснований для выделения особого типа мышления (алгоритмического), свойственного детям, проявляющим способности

к программированию, и о существовании неоднозначных соотношений между уровнем его развития и IQ-оценками, полученными с помощью традиционных психометрических тестов. Авторский учебный курс и методика диагностики уровня способностей к программированию могут применяться в работе с детьми 6–7 лет.

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НЕЙРОЛИНГВИСТИЧЕСКИЙ АНАЛИЗ РЕЧИ У ДЕТЕЙ С АУТИЗМОМ И ТРУДНОСТЯМИ ОБУЧЕНИЯ

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Известно, что при расстройствах аутистического спектра отмечаются речевые нарушения как устной речи, так и ее понимания (Лебединский 1985, Манелис 1999 и др.). Дефицит понимания речи выражается у детей, прежде всего, в трудностях интерпретации подтекста, намерений и эмоциональных состояний других людей, понимания метафорических высказываний, где значение выражения и значение говорящего не совпадают. Некоторые авторы объясняют это нарушением «модели психического», недостаточной чувствительностью к психическому состоянию другого человека (Аппе 2006, Baron-Cohen 2001, Frith 1993). В ряде нейropsychологических работ в качестве механизма таких нарушений называют дефицит холистической (правополушарной) стратегии переработки информации (Манелис, 1999; Ахутина 2009). Активно обсуждается вопрос о включенности подкорковых структур, в том числе структур, входящих в «социальный мозг» — сложную систему связей областей мозга, способствующую узнаванию других людей и пониманию их чувств, действий, психических состояний (Яхно и др. 2009, Pierce et al. 2001).

Несмотря на то, что особенности речевых нарушений при аутистических расстройствах широко представлены в литературе, нет единого

мнения об их соотношении с функционированием различных зон мозга. В нашем исследовании проводится нейролингвистический анализ особенностей речи детей с аутистическими расстройствами в сравнении с речью детей с трудностями обучения, имеющими парциальные отклонения в развитии ВПФ. Это позволяет определить специфику нарушений на лексико-грамматическом и особенно смысловом уровне организации речи, а также выдвинуть предположения о причинах основных нарушений, лежащих в основе речевой симптоматики при расстройствах аутистического спектра.

Испытуемые. В исследовании принимал участие 131 ребенок в возрасте 8–10 лет: 33 ребенка с аутистическими расстройствами (далее АР) и 98 детей с трудностями обучения (далее ТО).

Методика включала два блока проб. Первый блок представляет совокупность нейropsychологических проб, каждая из которых направлена на определение состояния какого-либо одного структурно-функционального компонента ВПФ. Пробы второго блока позволяют провести анализ особенностей связной речи ребенка на лексико-грамматическом и смысловом уровнях. Сюда вошло 1) составление предложений по картинкам (10 предложений); 2) составление рассказов по трем сериям картинок и по одной картинке.

Результаты. Анализ нейropsychологических профилей детей с ТО позволил выделить три

группы испытуемых: 34 ребенка с преимущественной слабостью функций программирования и контроля деятельности, серийной организации движений и действий (далее ТО-1); 33 ребенка со слабостью переработки кинестетической и слухоречевой информации (далее ТО-2); 31 ребенок со слабостью зрительных, зрительно-пространственных функций, холистической (правополушарной) стратегии переработки информации (далее ТО-3).

У детей с АР обнаружилось нарушение функций программирования и контроля деятельности, сравнимые с результатами группы ТО-1, и слабость правополушарных функций (дефицит холистической стратегии переработки информации, зрительных и зрительно-пространственных функций), аналогичная группе ТО-3. Снижение нейродинамических характеристик присуще всем обследованным группам, при этом у детей с АР они были выражены значимо больше только в сравнении с группой ТО-2.

Особенности развития речи у детей с ТО и АР. Было выяснено, что у детей с АР имеются нарушения построения связной речи на смысловом и лексико-грамматическом уровнях порождения речи.

Результаты детей с АР оказались наиболее близки к особенностям речи детей группы ТО-3. У обеих групп в центре речевой симптоматики обнаружены когнитивные нарушения смыслового уровня. Наиболее характерными для них оказались ошибки по типу *смыслового искажения*: противоречивое, малореалистичное описание событий, отсутствие целостности в повествовании, которое могло сочетаться с ошибочным восприятием и перцептивным игнорированием нескольких компонентов картинок. Можно предположить, что эти ошибки связаны с дефицитом холистической (правополушарной) стратегии переработки информации. В отличие от группы ТО-3, для детей с АР специфическими оказались искаженные эмоциональные реакции на содержание картинки, выраженные трудности осмысления контекста ситуации, социальных отношений персонажей, понимание их эмоционального состояния и намерений, что позволяет предполагать включенность структур, входящих в «социальный мозг».

Для групп ТО-1 и ТО-2, напротив, характерными оказались ошибки по типу *смысловой неполноты* (пропуск существенных деталей повествования, смысловые разрывы). При этом у

детей группы ТО-1 такие ошибки были обусловлены наличием трудностей программирования, составления схемы высказывания, в то время как у детей группы ТО-2 первичными были лексические трудности. Заметим, что затруднения в составлении схемы высказывания были характерны и для части детей с АР, в картине нарушений которых была выявлена слабость функций программирования и контроля деятельности.

Таким образом, сопоставление результатов детей с АР с речью детей с ТО позволило увидеть общее и специфическое в их речевых нарушениях на разных уровнях организации речи. Комплексность симптоматики, сочетающей речевые и неречевые нарушения у детей с АР, может свидетельствовать о включении в патологический процесс не только корковых (прежде всего правого полушария и III блока мозга), но и подкорковых структур и их взаимодействия. Выявленные особенности организации речи детей с АР, протекающие на фоне слабости энергетических функций, вписываются в сложный синдром когнитивных нарушений и нарушений эмоционально-мотивационной регуляции, который включает нарушение коммуникативной функции речи, процесса понимания и выражения эмоциональных реакций, социального взаимодействия и ролевого поведения.

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КОГНИТИВНЫЕ НАРУШЕНИЯ ПРИ ДЕПРЕССИВНЫХ СОСТОЯНИЯХ РАЗЛИЧНОЙ ЭТИОЛОГИИ

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Когнитивные нарушения при депрессивных состояниях различного генеза являются довольно распространенным явлением как в общемедицинской, так и в психиатрической практике. Депрессии в современном обществе представляют собой серьезную проблему, которая может проявляться у индивидуума снижением или потерей работоспособности, социальными и, наконец, суицидальными тенденциями. Классическое описание депрессивного синдрома характеризуется снижением настроения, моторной заторможенностью, а также замедлением ассоциативных (когнитивных) процессов.

Нами была предпринята попытка проанализировать степень выраженности когнитивных нарушений в зависимости от этиологии депрессивного синдрома, выявить взаимосвязь этих расстройств с определёнными структурами головного мозга и определить степень их обратимости.

Для этого исследования были отобраны пациенты (66 человек), страдающие депрессией различной этиологии. Были выделены 3 группы – с эндогенной депрессией (22 человека), с невротической депрессией (21 человек) и с органической депрессией (23 человека). С целью повышения валидности исследования всем больным до начала антидепрессивного лечения была проведена оценка выраженности депрессивного состояния по шкале Гамильтона (HDRS), что в балльной оценке составило от 17 до 27 баллов, и это клинически соответствовало умеренно выраженному депрессивному эпизоду (Международная классификация болезней 10-го пересмотра).

Для оценки когнитивных функций использовался стандартный нейропсихологический метод исследования (по А. Р. Лурия), адаптированный нами таким образом, чтобы была возможность оценить все основные структуры мозга с соотносением их принадлежности к трём функциональным блокам: первому блоку (энергетическому); второму блоку (по приёму, переработке и хранению информации); третьему блоку (программирования и контроля за протеканием психической деятельности), согласно концепции А. Р. Лурия. Исследование

проводилось дважды – до начала лечения и по мере купирования депрессивной симптоматики.

У больных с эндогенной депрессией при нейропсихологическом исследовании отмечалась следующая симптоматика: снижение слухоречевой и зрительной памяти как на непосредственном, так и на отсроченном этапах в пробах как с гетерогенной, так и с гомогенной интерференцией; замедление выполнения проб на оценку всех видов праксиса – конструктивного, динамического, кинестетического и пространственного; ухудшение оценки невербальных стимулов; в пробах на исследование интеллекта («4-й лишний») ошибок в выполнении задания не отмечалось, однако прослеживалось умеренно выраженное замедление ассоциативных процессов (брадифрения). В целом в процессе исследования в данной группе отмечались снижение и истощаемость активного внимания. Такая симптоматика по своим проявлениям является диффузной и преимущественно указывает на заинтересованность подкорковых структур головного мозга (ретикулярная формация ствола мозга, неспецифические структуры среднего мозга, диэнцефальные отделы, лимбическая система, медиобазальные отделы коры лобных и височных долей мозга), что соответствует первому энергетическому блоку. По мере купирования депрессивной симптоматики отмечалась и редукция когнитивных расстройств, что свидетельствовало об их обратимости.

У больных с невротической депрессией, судя по результатам нейропсихологического исследования, энергетический блок был вовлечен значительно в меньшей степени, чем в предыдущей группе. Однако определенные клинические данные указывали на повышенную истощаемость этих больных, что проявлялось астеническими расстройствами, в отличие от предыдущей группы, где превалировала анергическая (апатическая) симптоматика. В большинстве случаев выявлялись своеобразные нарушения мышления по невротическому типу с идеями жалости к самому себе, социально-бытовой несостоятельности, тревожности и бесперспективности. При исследовании моторных функций часто выявлялись ошибки различных видов праксиса с суетливостью и раздражительностью. Особенно страдал динамический праксис в пробе на реципрокную координацию и в трехэтапной пробе «кулак-ребро-ладонь», где отмечалась межполушарная асимметрия с акцентом на правое полушарие. Данный

нейропсихологический комплекс указывает на большую вовлеченность задне-лобных и теменно-височных отделов коры головного мозга, что коррелирует с третьим и вторым функциональными блоками. Отмеченные когнитивные нарушения также были в большинстве случаев обратимыми.

Нейропсихологическая симптоматика больных с органическими депрессиями отличалась стойкостью, неоднородностью и разнообразием. Полиморфизм симптомов был обусловлен, с одной стороны, диффузностью воздействия патогенных факторов на головной мозг, а с другой стороны, разнообразием локализаций органического патологического процесса. Отмечалась специфичность нарушений памяти, которая была связана с локальностью поражения определенных отделов головного мозга. Так, при поражении затылочных и теменно-затылочных отделов головного мозга мы наблюдали снижение зрительной памяти. Снижение слухоречевой памяти в большинстве случаев было обусловлено поражением височных отделов, когда выявлялась четкая взаимосвязь межполушарной локализации патологического процесса с этапом воспроизведения запоминаемого материала. Лобная локализация поражения проявлялась нарушениями в пробах на динамический праксис. Трудности при выполнении проб, исследующих кинестетический, пространственный и конструктивный праксис, указывали на теменную и теменно-затылочную локализацию

патологического процесса. Довольно частым нарушением высших корковых функций были расстройства тактильного восприятия, что также указывало на теменные отделы. У отдельных больных этой группы встречались негрубые нарушения речи в виде элементов моторной, сенсорной или семантической афазии. Основываясь на концепции о функциональных блоках мозга, можно сказать, что у данных больных могли быть вовлечены все три блока, что в значительной степени было связано с характером органического заболевания.

Таким образом, проведенное нами исследование показало специфику когнитивных нарушений у больных с депрессивной симптоматикой различной этиологии и позволило сделать вывод об обратимости данных расстройств в группах больных с эндогенными и невротическими депрессиями.

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О КОГНИТИВНОЙ ПЕДАГОГИКЕ, АКМЕОЛОГИИ И ПЕДАГОГИЧЕСКОЙ ПСИХОЛОГИИ (НА МАТЕРИАЛЕ ФОРМИРОВАНИЯ ИНОЯЗЫЧНОЙ РЕЧИ)

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В настоящее время под когнитивной парадигмой в педагогике и педагогической психологии чаще всего имеется в виду парадигма «знаниевая», а также учебный процесс, имеющий модульную структуру. На наш взгляд, это не вполне верно. Педагогическая психология в когнитивной модели должна являться неотъемлемой частью когнитивной психологии, которую прежде всего интересуют *механизмы получения и обработки информации*: механизмы восприятия (как информация воспринимается и понимается), механизмы памяти (как информация запоминается и забывается), мышления (как

человек думает, решает проблемы), механизмы речи (как речь воспринимается, приобретается и порождается, как при помощи языка человек выражает мысли); эту психологию интересуют и связь психического с нейрофизиологическим субстратом (человеческим мозгом). В основе же когнитивной педагогики непременно должна лежать когнитивная педагогическая психология, которая призвана заниматься всеми перечисленными вопросами применительно к теории, методике и практике обучения. Этим же, с нашей точки зрения, призвана заниматься и когнитивная акмеология – часть возрастной психологии, имеющая дело с взрослыми людьми (зрелой личностью), в том числе и с их обучением. Именно такой когнитивный подход к указанным выше наукам мы осуществляем в своей работе.

Данное сообщение посвящено результатам исследования механизмов речи и разработке методов ее формирования на экспериментальном акмеологическом материале по обучению иностранным языкам. Под механизмами мы понимаем внутреннее устройство речи как сложного многостороннего явления, а под методами – внешние способы воздействия на эти механизмы с целью эффективного формирования иноязычной речи у взрослых людей. Мы исходили из того, что механизмы речеформирования являются, в главных чертах, общими как для развития речи в онтогенезе, так и для развития иноязычной речи в разрезе акмеологии, а также из того, что общими могут являться и закономерности методов воздействия на это развитие с целью его ускорения и улучшения.

В докладе представлена новая многоаспектная концепция речи в единстве всех ее сторон (языковой, психической, физиологической, личностной, поведенческой, деятельностной), а также базирующееся на данной концепции теоретическое описание действующей системы обучения иноязычной речи, которая так же многоаспектна и интегративна, как и само речевое явление, и каждой своей методической гранью направлена на соответствующие стороны речевого процесса, которые необходимо формировать. Эта система обучения ориентирована на развитие речевой способности, процессов речевосприятия и речепорождения через раскрытие механизмов их функционирования.

Исследование родилось из того, что на протяжении 25 лет мы обучали взрослых людей иностранным языкам (английскому, русскому как иностранному, хинди) разработанными нами психолингвистическими и лингво-психологическими методами. Используя обширную базу данных по овладению иноязычной речью более полутысячи человек, наблюдая людей в процессе их языкового развития и совершенствуя техники обучения, мы занимались психолингвистическим изучением самой речи и проблемами ее формирования в широком понимании термина «речь». Мы исходили из выдвинутой нами интегративной теории речи как единства семиотической системы, психической активности (включая деятельность и поведение), психического и психофизиологического процессов, особого свойства личности. Нами исследовались внешние и внутренние механизмы развития языковой способности, которая (по аналогии с классической дихотомией «язык – речь») была расширена до понятия способности речевой. Речевая способность рассматривалась как особая психическая и

психофизиологическая функция, обеспечивающая человеку овладение речью и включающая в себя не только собственно языковые коды, но и те экстралингвистические коды, которые приводят эту языковую систему в действие. На основе этого понятия были разработаны и апробированы механизмы формирования иноязычной речи у взрослых людей.

Изучение механизмов развития речевой способности, процессов речевосприятия и речепорождения проходило через исследование взаимоотношений речи с сознанием и подсознанием, эмоциями и интеллектом. При этом все психические процессы без исключения, как когнитивные, так и эмоциональные, не просто сопрягались с речью, но рассматривались как неперенные речевые составляющие. Речь также рассматривалась в контексте ее отношений с психическими свойствами и состояниями личности. На материале обучения иноязычной речи была прослежена связь между когнитивным (восприятием, вниманием, памятью, мышлением, воображением, интеллектом) аспектом речи, психодинамической (аффективной, побудительной, эмоциональной) ее стороной и коммуникативным аспектом речи.

Как правило, исследования, посвященные подобной проблематике (а таких комплексных работ, выполненных в междисциплинарном ключе, крайне мало), обращались к родной детской речи как к экспериментальному материалу, а также к данным обучения детей второму после родного языка. Специфика данной работы заключалась в исследовании и развитии речевой способности, восприятия и порождения иноязычной речи у взрослых людей, что, с одной стороны, отличалось от естественного процесса обретения человеком речи, а с другой стороны, во многом его воспроизводило и моделировало. Кроме того, работа со взрослыми людьми позволила получать научные данные за укороченные (по сравнению с развитием речи у детей) сроки времени, в силу интенсификации процесса обучения, которая кристаллизовала механизмы речевосприятия и речепорождения. В свою очередь, изучение речевых процессов, механизмов их становления, развития и функционирования предоставило возможность разработать не только общую теорию речеформирования, но и научную базу высоких и тонких обучающих технологий. Как прикладной результат, на базе указанных технологий была создана (Румянцева 2004) инновационная интенсивная система обучения – «Интегративный лингво-психологический тренинг» (ИЛПТ), который позволяет людям активно овладевать

иностранными языками в значительном объеме (3–4 тысячи лексических единиц на основе всей нормативной грамматики) в сжатые сроки (7 недель, 100 академических часов).

Необходимо подчеркнуть, что под обучением иноязычной речи нами понимался не традиционный грамматико-переводной способ, а именно развитие речезыковой способности, процессы восприятия и порождения речи при помощи психологических тренинговых средств, имеющих коммуникативную основу и затрагивающих все психические процессы, свойства и состояния личности. При этом мы исходили из того, что речь, охватывая всю психику человека,

выполняет в ней структурообразующую и интегративную функцию.

Такой подход к обучению иноязычной речи является когнитивным по своей сути, т.к. создание обучающей системы базировалось на исследовании механизмов речи, и все обучающие технологии разрабатывались с учетом их функционирования.

Теоретические и прикладные результаты данного исследования и предлагается представить в презентации.

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ВЗАИМОДЕЙСТВИЕ КОНЦЕПТУАЛЬНОЙ МЕТОНИМИИ И МЕТАФОРЫ ПРИ ОБРАЗОВАНИИ СУФФИКСАЛЬНЫХ НЕОЛОГИЗМОВ

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Динамика изменений, происходящих в современной англоговорящей картине мира, находит яркое воплощение в лексических инновациях, репрезентирующих различные области человеческой деятельности. Когнитивные исследования этих инноваций помогают выявить специфику изменения концептов и категорий на современном этапе, ибо «новое слово – это, прежде всего, способ введения новых концептов» (Заботкина 1991: 165). Одними из наиболее продуктивных когнитивно-семантических способов образования новых слов и их значений были и остаются метонимия и метафора, представляющие собой базисные когнитивные операции, суть которых сводится к проецированию в концептуальных доменах: метонимическое проецирование происходит в пределах одного домена, в то время как метафорическое – между различными доменами (Lakoff, Johnson 1980: 35–39; Lakoff 1987; Kövecses, Radden 1999). Нашей целью является исследование взаимовлияния этих двух когнитивных операций при образовании новых существительных в английском языке с помощью продуктивного словообразовательного суффикса *-er*.

На современном этапе развития английского языка удельный вес морфологических неологизмов среди прочих лексических новообразований довольно высок (Рунова 2006: 168–169). Суффиксальные единицы,

представляющие довольно репрезентативную группу, образованы с помощью трех основных суффиксов: *-er*, *-ie/-y* и *-ee*. Наиболее продуктивным среди них является суффикс *-er*. К. У. Пантер и Л. Торнбург (Panther and Thornburg 2002) отмечают его полисемантическую природу и утверждают, что его значения концептуально связаны посредством метонимии и метафоры. Вслед за авторами мы предпримем попытку доказать, что метонимические и метафорические процессы свойственны не только лексической основе существительных с суффиксом *-er*, но и самому суффиксу. Если представить рассматриваемые единицы в виде идеализированной модели человеческой деятельности, то ее составными частями-концептами будут МЕСТО и ВРЕМЯ протекания действия и его УЧАСТНИКИ (СУБЪЕКТ/ОБЪЕКТ ДЕЙСТВИЯ, ИНСТРУМЕНТ). Центральным концептом, мотивирующим связи между различными типами референтов (одушевленными/неодушевленными, абстрактными сущностями, событиями и др.) и семантических ролей (субъект/объект, инструмент, место и др.), выступает концепт ЧЕЛОВЕК – СУБЪЕКТ ДЕЯТЕЛЬНОСТИ. В результате концептуального анализа примеров нашей выборки были выявлены следующие модели существительных с суффиксом *-er*:

1) объект реф + *-er* Проф. деятель (человек): *dot-commer* – a person who works in the industry or are employed at a dot-com. Метонимия основы – ЧАСТЬ (адрес организации) – ЦЕЛОЕ (организация) + суффикс *-er* ДЕЯТЕЛЬ; **2) объект реф + *-er* Деятель (человек): *grab-and-goer* – a person who**

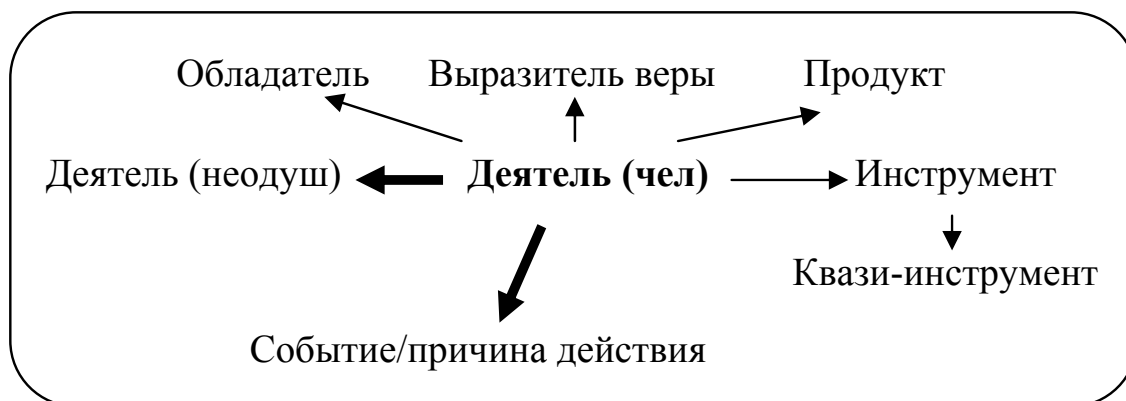


Рис. 1. Метонимическое и метафорическое развитие значения суффикса *-er* от базисного концепта.

dislikes shopping, or does not have much time for shopping, and so tends to select items quickly and without much thought. Метонимия основы – часть сценария «Покупки» (выражена глаголом); 2) **объект реф + -er Деятель (человек) / Обладатель: *pin striper* – a business executive (from «pinstripe suit», as typical of a business executive)**. Метонимия основы – ПРИЗНАК – ПРЕДМЕТ (ОБЛАДАЕМОЕ) + суффикс *-er* ОБЛАДАТЕЛЬ. Референтом основы в этой модели может также выступать концепт ВРЕМЯ: *nexter* – a person who is part of the generation born in 1978 or later; 3) **объект реф + -er Деятель (человек) / Выразитель веры: *birther* – a person who believes that U.S. president Barack Obama was not born in the United States, and is therefore ineligible to be president**; 4) **объект реф + -er Квази-инструмент: *topsider* – a soft leather or canvas shoe with a low heel and soft rubber sole, designed for casual wear, originally for walking on a boat's top side** (метонимия основы – МЕСТО-ОБЪЕКТ). «Полуинструментальная» функция таких объектов заключается в том, что они, подобно инструментам, косвенно помогают субъекту совершать действие; 6) **объект реф + -er Деятель (неодуш) / Причина события: *coffee-spitter* – something that is outrageous, shocking, or upsetting, particularly a newspaper headline or article.** Метонимический перенос ПРИЧИНА-СЛЕДСТВИЕ функционирует на уровне основы, тогда как на уровне суффикса осуществляется метафорическое

проецирование из области «Субъект действия» в область «Событие – причина действия»; 7) **объект реф + -er Деятель (неодуш/одуш): *thumbsucker* – a lengthy story or opinion piece based on a vast, complex topic; a journalist who writes such articles.** В основе лежит метафора «Высосать из пальца – выдумать», а суффикс получает метонимическое развитие ПРОДУКТ – ПРОИЗВОДИТЕЛЬ.

Суммируя значения суффикса *-er*, можно вывести следующую схему, показывающую метонимическое и метафорическое развитие его значения (обычной стрелкой обозначен метонимический перенос, жирной – метафорический):

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МЕТАКОГНИТИВНЫЙ МОНИТОРИНГ ЗНАНИЯ КОНКРЕТНОЙ ПРЕДМЕТНОЙ ОБЛАСТИ

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Метакогнитивный мониторинг относится к регулятивному аспекту метапознания и представляет собой отслеживание познавательной активности и ее результатов непосредственно в процессе решения какой-либо познавательной задачи. Операционализация конструкта «метакогнитивный мониторинг» осуществляется в процедурах измерения различных типов метакогнитивных суждений, то есть суждений, которые испытуемый делает о своих собственных знаниях и познавательных актах на различных стадиях решения какой-либо задачи. Одной из разновидностей этих суждений являются суждения уверенности (*confidence judgments*). Обычно в этом случае испытуемого просят высказать (используя различные шкалы) степень своей уверенности в правильности решения задачи, а затем сопоставляют эти оценки с результативностью решений (т.н. парадигма калибровки). К настоящему времени в рамках этой парадигмы эмпирически зафиксированы связи между качеством метакогнитивного мониторинга в аспекте уверенности и различными объективными и субъективными переменными (Скотникова 2002; Hacker et al. 2008). Вместе с тем, значительное количество исследований было проведено в контексте лабораторного исследования с использованием простых когнитивных задач. Факторы, определяющие особенности метакогнитивного мониторинга применительно к задачам реальной жизнедеятельности (например, в учебном контексте), исследованы недостаточно.

Методика исследования. В двух сериях исследования оценивалась с использованием процедуры калибровки уверенность в знании двух конкретных предметных областей (курсов общей и педагогической психологии). Параллельно с этим оценивался ряд когнитивных и личностных характеристик испытуемых – рефлексивность (Карпов 2003), самооффективность, мотивация учения, особенности имплицитных теорий учения (Корнилова, Смирнов и др. 2008), личностная уверенность.

Результаты и обсуждение. Для оценки взаимосвязи уверенности с другими показателями были рассчитаны коэффициенты ранговой корреляции по Спирмену. Результаты *первой серии*

исследования продемонстрировали, что в целом по выборке существует положительная, но слабая взаимосвязь между уверенностью и количеством правильных ответов ($r=0.23$; $p<0.1$). Это указывает на то, что оценка уверенности в ответе лишь в незначительной степени опирается на знание соответствующей предметной области. С другой стороны, рефлексивность положительно коррелирует с уверенностью, что свидетельствует об общности метакогнитивных механизмов, лежащих в их основе ($r=0.34$; $p<0.05$). Однако более детальное изучение данных позволило предположить наличие нелинейной взаимосвязи между степенью освоенности знания и уверенностью. Дальнейший анализ подтвердил это предположение. Выборка по медиане показателя знания (11 баллов) была разделена на две субгруппы: «хорошо» ($n=32$) и «плохо» ($n=27$) знающих и были рассчитаны корреляции между показателями уверенности и знания для каждой из субгрупп. Соответствующие коэффициенты равны -0.26 (не знач.) для группы «плохо» знающих и 0.35 ($p<0.05$) для группы «хорошо» знающих. Отрицательный коэффициент корреляции для группы «плохо» знающих отражает в данном случае описанный в литературе эффект сверхуверенности на фоне реально низкого уровня владения знанием («чем меньше знаю, тем более уверен») (Hacker et al. 2008). Вместе с тем, меняется и картина взаимосвязи рефлексивности и уверенности. Для группы «хорошо» знающих такая взаимосвязь близка к нулю ($r=-0.11$). Для группы «плохо» знающих – положительна ($r=0.53$; $p<0.01$): на фоне недостаточного владения предметной областью более рефлексивные испытуемые дают более уверенные ответы.

Анализ данных *второй серии* исследования прежде всего показывает, что в целом испытуемые были менее успешны в усвоении предметно-специфического знания, в сравнении с испытуемыми первой серии ($M_e=9$, против 11 – в первой серии). Это подтверждается и результатами экзамена по соответствующим дисциплинам. Для первой серии показатели экзамена по курсу $M_e=4$; Мода=5 (43% получили отличные оценки), для второй серии $M_e=3.5$; Мо=3 (48% получили удовлетворительные оценки). Таким образом, во второй серии мы имеем дело с уверенностью в знании в условиях *низкого* и *среднего* уровня освоения этого знания. В этих условиях взаимосвязь успешности в тесте и уверенности отсутствует ($r=0.07$),

что согласуется с результатами первой серии, где эта связь для «плохо» знающих также не наблюдалась. Вместе с тем, наблюдается взаимосвязь, во-первых, с показателями успешности предшествующего обучения ($r=0.38$; $p<0.01$) и, во-вторых, с самооценкой обучения опроснику ИТ ($r=0.34$; $p<0.05$). Разделение данной выборки на подгруппы по относительной успешности в тесте (ниже и выше 9 баллов) позволяет акцентировать роль предшествующего опыта обучения в оценке уверенности: корреляция этого показателя с предшествующей успеваемостью для подгруппы «знающих» (набравших больше 9 баллов) составила 0.56 ($n=22$; $p<0.05$).

Полученные результаты в целом свидетельствуют об отсутствии линейной взаимосвязи между знанием в конкретной предметной области и уверенностью в этом знании. Скорее, наблюдается своего рода фазовая динамика взаимосвязи уровня владения знанием и формированием уверенности в этом знании. При этом на разных этапах (фазах) освоения знания источники уверенности могут быть различными. Так, известно, что субъект может выносить уверенные суждения, опираясь не только на актуализируемое релевантное знание, но и исходя из общей оценки своей компетентности в данной области (подобный механизм формирования оценок уверенности был описан А. Кориатом (Koriat 2000), хотя и в несколько ином теоретическом контексте). В случае решения задач, актуализирующих предметно-специфическое знание,

субъект на фоне недостаточного владения этим знанием формирует оценки уверенности, опираясь на свой предшествующий опыт обучения в сходной области и основанную на этом опыте самооценку собственной учебной успешности (как показала вторая серия исследования) или же исходя из оценки своих метакогнитивных возможностей (в виде общей рефлексивности), которые в целом способствуют успеху в учебной деятельности (как продемонстрировала первая серия исследования). Однако на более высоком уровне усвоения эти дополнительные источники уверенности утрачивают свое значение, поскольку оценка уверенности основывается на непосредственной актуализации релевантного предметно-специфического знания.

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КОГНИТИВНАЯ КЛАСТЕРНАЯ МОДЕЛЬ МИНИМАЛЬНЫХ РЕЧЕВЫХ ЕДИНИЦ В ЗАДАЧАХ АНАЛИЗА И РАСПОЗНАВАНИЯ РЕЧИ

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При анализе устного текста на русском языке мы опираемся на наши точные знания в отношении его фонетического строя, количественного и качественного состава используемой фонетической системы, а также закономерностей ее функционирования в разговорной речи. Этими знаниями мы пользуемся, например, при транскрибировании потока речи.

Проблема состоит в том, что разговорная речь по своим акустическим характеристикам широко варьируется, причем не регулярным

образом, не только от одного языка к другому, но и от одного носителя к другому носителю одного и того же языка. В указанных условиях становится проблематичной сама идея выделения *повторяющегося* набора минимальных звуковых единиц (МЗЕ) из разговорного потока. Кроме того, длительность отдельных МЗЕ не превышает нескольких миллисекунд, и это главное препятствие для применения традиционных методов теоретической лингвистики к разговорной (устной) речи. С другой стороны, до настоящего времени проблема не была преодолена и методами экспериментальной фонетики. И главная причина здесь – отсутствие *адекватной системы описания отдельных фонем*.

В поисках путей решения указанной проблемы в недавно созданной информационной

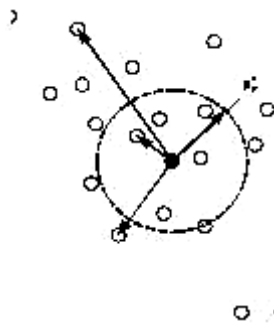


Рис. 1. Кластер реализаций фонемы

теории восприятия речи (ИТВР) само понятие «фонема» впервые было строго определено в теоретико-информационном смысле как «множество однородных МЗЕ, объединенных в кластер по критерию минимального информационного рассогласования (МИР)

в метрике Кульбака-Лейблера». Условно говоря, человеческий мозг объединяет и запоминает в себе как нечто целое (в виде абстрактного образа) разные образцы (произношения) каждой отдельной фонемы в соответствующей «сфере» своей памяти вокруг абстрактного «центра» с заданным «радиусом» (рис. 1). Нетрудно понять, что этим определением одновременно решается множество актуальнейших проблем в области фонологического анализа: и вариативности разговорной речи, и априорной неопределенности, и адекватного описания звукового строя языка с кардинальным сжатием данных, и, наконец, проблема обновления речевых баз данных (РБД) без разрушения их структуры.

Для экспериментальных исследований была разработана информационная система фонетического анализа и тестирования слитной речи. Программа экспериментальных исследований была разбита на два этапа. На первом этапе осуществлялось формирование базы эталонов МЗЕ по группе тестируемых дикторов, а на втором – исследование особенностей звукового строя речи тех же дикторов в комфортных и некомфортных условиях. При этом применялись стандартные программные и аппаратные средства ВТ. Формирование фонетической базы эталонов происходило следующим образом.

Вначале для каждой из основных (продолжительных) фонем русского языка было записано в комфортных условиях по одному образцу МЗЕ от выбранного диктора-мужчины. Затем к этим образцам были добавлены эталоны того же диктора в тех же условиях, но произнесённые в разное время суток. При этом диктор произносил каждую фонему по 15–20 раз. Звуковой сигнал вводился в информационную систему в реальном времени в режиме «Подготовка данных». Всего таким образом было сформировано шесть персональных баз эталонов от шести дикторов-мужчин, а также две базы эталонов от дикторов-женщин.

На втором этапе каждый диктор в заведомо менее комфортных условиях: в нашем случае – после значительной физической нагрузки (пульс 140–160 ударов в мин.) произносил каждую из 21 фонем по 10–15 раз. И каждый раз информационной системой фиксировался соответствующий результат: текущее значение величины информационного рассогласования (ВИР) по отношению к заранее сформированной базе эталонов. Цель данного эксперимента – выбрать из общего списка фонем национального языка те фонемы, которые наиболее остро реагируют в своих реализациях на условия произнесения их диктором. Смысл этой цели очевиден – настраивая информационные системы на наиболее чувствительные фонемы, мы гарантируем максимальную чувствительность нашего восприятия по отношению к эмоциональному и физическому состоянию диктора. Важнейший момент – это количественная характеристика степени возбуждения диктора, а именно: ВИР между фонемами в текущем сигнале и их эталонами. Для иллюстрации сказанного на рис. 2, 3 представлены две диаграммы ВИР при произнесении фонемы «Х» некоторым диктором-мужчиной в комфортных (рис. 2) и некомфортных (рис. 3) условиях. Здесь центр окружностей характеризует положение первого эталона в пределах Х-кластера одноименных МЗЕ. А каждая окружность – это результат очередного произнесения фонемы. Ее радиус определяется значением ВИР по отношению к эталону. Чем больше радиус, тем хуже качество произнесения. Видно, что при изменении условий на некомфортные в среднем на порядок увеличилась вариативность произнесений данного диктора (см. шкалу делений по оси абсцисс). Аналогичные результаты были получены и для других дикторов из контрольной группы.

К числу приоритетных направлений применения ИТВР и ее когнитивной кластерной модели МЗЕ (рис. 1) наряду с автоматической

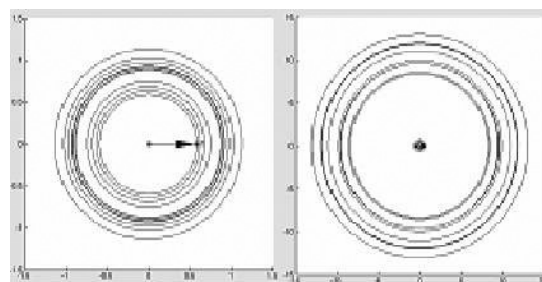


Рис. 2 Фонема «Х» - комфортные условия

Рис. 3 Фонема «Х» - некомфортные условия

обработкой и распознаванием речи относятся, прежде всего, проблемы современной диалектологии и языкознания. Полученные результаты открывают здесь качественно новые возможности для решения целого ряда актуальных задач, которые до настоящего времени остаются в мире нерешенными или решены неудовлетворительно, в том числе:

1) создание персональных (под каждого диктора) речевых баз данных;

2) анализ качества устной речи на базовом, фонетическом уровне;

3) автоматическое тестирование качества систем речевой связи и другие.

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КОГНИТИВИСТИКА И РИТОРИКА

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В имени представлено понимание предмета, имя является фиксацией этого понимания. Произведение словесности – сложное структурированное имя, которое в идеале может быть свернуто в заглавие, представляющее собой главное ключевое слово произведения.

Метод создания словесных произведений, представленный классическим риторическим канон (изобретение, расположение, выражение) является методом перевода мысли/понимания в слово. Процедура, позволяющая на основании слова восстановить авторское понимание предмета, закодированное в произведении словесности, то есть правильно понять данное произведение, может быть названа риторическим анализом.

Риторический анализ позволяет декодировать образ, продвигаемый текстом, его структуру и способы продвижения. Риторический анализ включает: (1) выявление идей текста, (2) установление характера их раскрытия и развития в тексте, (3) исследование способов представления идей, то есть способов управления восприятием речи.

Идеи текста закодированы при помощи ключевых слов. Каждая отдельная идея текста раскрывается рядом предикатов, которые, взятые вместе, образуют уникальную систему. Слова, выражающие предикаты, несут в тексте основную новую информацию, то есть являются ключевыми. Значение каждого ключевого слова определяется его положением в идее, оно соотносится со значениями других ключевых слов и ограничено ими. Контекстное значение ключевого слова не равно его языковому значению. Значения ключевых слов в тексте, в силу того,

что функцией этих слов является формирование смысла новой идеи, являются переносными, метафорическими. Метафоризация привносит с собой в текст исторические и культурные ассоциации. Совокупность ключевых слов образует систему, наглядно представляющую видение идеи автором и читателем/слушателем, то есть ее образ.

Последовательность ключевых слов скрывает в себе программу восприятия образа и отражает постепенный характер его раскрытия через слова. Правильное восприятие образа становится возможным благодаря способности воспринимающего речь чувствовать различия между языковым значением слова и его значением в данном контексте.

Отношения ключевых слов разных рядов между собой образуют идейную (смысловую) композицию текста в ее развертывании – смысловой ритм текста. Смысловая композиция, представленная в виде схемы, есть схема образа. Значение ее в том, что она показывает смысловую связь, которая в тексте присутствует только имплицитно и воспринимается подсознательно.

Итак, образы формируются системой ключевых слов. Линейное расположение этих слов в тексте отражает присущий данному тексту характер развития (создания) образов. Композиция ключевых слов в статике дает схему образа, в динамике она раскрывает, кроме того, глубокий пласт продвижения образа – систему аргументов в развитии – композицию аргументов.

Привлечение внимания к ключевым для смысла текста моментам достигается не только благодаря определенному порядку и частоте ключевых слов. Большую роль в программировании читательского восприятия играет характер линейного расположения всех элементов текста. Словесное окружение ключевых слов является основой их правильного толкования

и средством их выдвижения. Контекст организуется вокруг ключевого слова таким образом, чтобы оно привлекало к себе внимание и могло оказать наибольшее воздействие на аудиторию. Можно сказать, что, в то время как ключевые слова несут индивидуальную авторскую идею, создают образ, контекст этот образ продвигает, создавая условия его должного (запрограммированного) восприятия.

Контекст создает среду, из которой образ постепенно проступает. Эта среда формируется при помощи языковых, стилистических и композиционных средств. К ним относятся отобранные автором и соответствующим образом ритмически организованные лексические и грамматические единицы языка, стилистические и композиционные приемы.

Исчерпывающее описание всего перечня свойств указанных категорий заняло бы не одну страницу. Здесь мы ограничимся лишь общей характеристикой категорий в интересующем нас разрезе.

Выбор слов. Словесное окружение ключевых слов (общелитературное, специальное или разговорное, оценочное положительное, нейтральное или отрицательное, эмоциональное или рациональное, описательное или динамичное, однозначное или полное ассоциаций и аллюзий, с преобладанием какой-либо грамматической категории или без того, относящееся преимущественно к какому-либо семантическому полю, и т.п.) определяет поле восприятия образа, то, в какой плоскости данный образ трактуется, с чем ассоциируется, какова точка зрения на него.

Выбор синтаксических конструкций. Синтаксическое построение фраз организует ритм изложения, расставляет акценты и тем самым руководит вниманием аудитории. Оно может утомить, усыпить аудиторию, чтобы затем резким перебоем ритма привлечь ее внимание к ключевым моментам. Волны синтаксического ритма одна за другой несут на своих гребнях новую информацию и упорядочивают таким образом восприятие. Какие синтаксические средства употребляются, зависит от автора, от того, какой принцип построения текста он избрал в соответствии со своей целью и материалом.

В отношении выбора слов и синтаксических конструкций значение имеют как качественные, так и количественные характеристики.

Средства стиля (тропы и фигуры речи). В силу того, что стилистические приемы всегда базируются на том или ином отклонении от привычной языковой нормы, в совокупности они представляют собой арсенал средств выдвижения одних элементов текста на фоне других.

Вопросы выбора и распределения в тексте слов и синтаксических конструкций, а также использования тропов и фигур, тесно связаны с тем, что в стилистике восприятия называется схемами выдвижения (последние основаны на определенном использовании первых). Схемы выдвижения позволяют поставить акценты на определенных фрагментах текста, выдвинуть отдельные элементы как более важные и при этом затуманить другие, и таким образом создать определенную иерархию значений внутри текста. К наиболее распространенным схемам выдвижения относят сцепление, градацию, обманутое ожидание и конвергенцию.

Средства композиции. С точки зрения композиционного выдвижения ключевых слов важным является сочетание их собственной композиции с композиционно сильными или отмеченными позициями текста. К последним относятся заглавие, начало, конец текста и др. Кроме того, на восприятие образа также влияют выбор жанрово-композиционной формы речи (статья, листовка и т.д.), формы речи по составу участников (диалог или монолог в прямой или превращенной формах), композиционно-речевой формы, связанной с модальностью высказывания (описание, повествование, доказательство), композиционной формы, связанной с типом повествования (повествование от первого лица, от третьего лица и их разновидности).

Владение данной методикой позволяет как быстро оценивать замысел чужой речи, посредством декодирования продвигаемых в ней образов, так и создавать собственные действенные речи.

В докладе представлены результаты риторического анализа романа В. Набокова «Дар».

ПРОЦЕССЫ АККОМАДАЦИОННОЙ РЕКОНСОЛИДАЦИИ ПРИ ОБУЧЕНИИ

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Закономерности всех наблюдаемых когнитивных процессов являются «проекциями», возникающими из закономерностей формирования и модификаций индивидуального опыта, поэтому изучение таких закономерностей является наиболее актуальной проблемой когнитивной науки. С позиции системно-селективной теории обучения (Швырков, 1986), формирование нового элемента индивидуального опыта происходит за счет специализации ранее неспециализированных нейронов относительно новой функциональной системы. В пользу этого предположения были также получены экспериментальные данные (Горкин, 1987). Вместе с тем можно предположить, что формирование новой системы, связанной с выполнением вновь выученного поведения, приводит к изменениям системного уровня, например, к изменению межсистемных отношений (Швырков, 1995). Такие процессы должны проявляться на уровне отдельных нейронов, в частности, за счет изменения функционирования отдельных нейронов, составляющих уже существующие системы, т.е. при научении изменениям должны подвергаться нейроны, уже имеющие специализацию. Такие процессы были названы аккомодационной реконсолидацией (Александров, 2005). Процессы аккомодационной реконсолидации могут быть, предположительно, связаны с нейрогенетическими изменениями (Сварник и др. 2011). Изменение экспрессии генов в нейронах могут быть детектированы путем маркирования головного мозга животных по наличию белка – транскрипционного фактора *c-Fos*, запускающего экспрессию множества новых для нейрона генов (Анохин, 1997). В данной работе мы экспериментально проверяли предположение о существовании модификаций нейронов, составляющих ранее сформированные системы. Для проверки данного предположения крысы, находящиеся в условиях водной депривации, были обучены питьевому навыку в экспериментальной клетке, содержащей поилку и рычаг. Для получения капли воды животным было необходимо осуществить касание либо левой (одна экспериментальная группа) либо правой (другая экспериментальная группа) вибриссной подушкой о рычаг. Поэтапное формирование

такого инструментального питьевого навыка занимало 6 дней. Последующие 5 дней животные практиковались в выполнении этого навыка. В течение этого же периода времени животные другой группы обучались неинструментальному питьевому навыку в отдельной клетке, где вода в поилке находилась в свободном доступе. На 12-й день животные были помещены в экспериментальную клетку, содержащую кормушку и педаль, где они могли сформировать пищедобывательное поведение. К этой пищевой клетке животные адаптировались по 5 минут в день (после окончания сессии в питьевой клетке) начиная с 6-го дня от начала экспериментальных манипуляций. Анализ нейрогенетических модификаций проводился после последней сессии пищедобывательного поведения при помощи иммуногистохимических процедур. Было обнаружено, что вибриссное поле соматосенсорной области коры головного мозга характеризуется достоверно большим числом *Fos*-положительных нейронов у животных, имевших опыт питьевого инструментального навыка, чем у животных, имевших опыт неинструментального питьевого навыка. Причем повышение числа таких нейронов происходит только в полушарии, контралатеральном по отношению к использованной вибриссной подушке. В ретроспективной коре таких различий обнаружено не было. Оказалось, что число нейронов вибриссной области, изменяющих экспрессию генов после пищедобывательного обучения, не зависит от того, насколько успешны они были в данном обучении, но зависит от того, насколько успешны они были несколько дней назад в первом, питьевом, навыке. Таким образом, нейрогенетическим модификациям после формирования второго (пищевого) навыка подвергались нейроны, преимущественно вовлекающиеся в формирование первого (питьевого) навыка. Полученные результаты свидетельствуют в пользу того, что нейроны, уже имеющие специализацию, подвергаются дополнительным модификациям (процессам аккомодационной реконсолидации) при формировании последующих навыков.

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В настоящее время актуальность исследования проблемы компьютерной игровой зависимости становится очевидной в связи с ростом компьютеризации разных сторон жизни человека. Ученые (Д. Голдберг, А. Е. Войскунский, М. Иванов, Г. В. Лосик, М. Орзак, Ю. В. Фомичева, А. Г. Шмелев и др.) указывают, что данная проблема является междисциплинарной, может рассматриваться в рамках медицины, психологии, педагогики, кибернетики и др. Появление такой зависимости свидетельствует о нарушении соматического и психологического здоровья, приводит к появлению нарушений в когнитивном и сенсорном развитии, но может рассматриваться как средство компенсации имеющихся у человека нарушений (напр., в коммуникации с другими людьми). Было установлено, что у подростков с компьютерной зависимостью происходит ухудшение перцептивных действий при восприятии предметов, что приводит к неверному учету их свойств, появлению ошибок [1].

С учетом эмпирических данных, которые были получены при проведении ряда исследований [1–2], была разработана коррекционно-развивающая программа «сенсомоторная гимнастика». Она направлена на развитие и коррекцию нарушений мелкой моторики, тактильного восприятия и внимания, коррекцию компьютерной зависимости. В ходе применения данной программы были использованы две авторские методики: проективная методика «Фокус внимания» для выявления преобладания амьентного или фокального (предметного) внимания (разработана на основе положений Б. М. Величковского об указанных видах внимания) и методика «Последовательное добавление анализаторов» для коррекции нарушений перцептивных действий руки и глаза подростков с компьютерной зависимостью (разработана на основе положений М. Монтессори) [2].

Для создания методик были решены задачи: разработан стимульный материал (карточки и сенсорные наборы из предметов с вариативной формой); процедура предъявления материала;

специальное устройство для записи движений рук подростка при ощупывании предметов; разработана процедура проведения и формула «матрица вычитания» (для оценки степени изменений перцептивных действий).

Для поэтапного предъявления предметов из сенсорных наборов и их сравнения был разработан алгоритм, включающий в себя три последовательных этапа: 1) предъявляются по две фигуры (всего 36 пар) для ощупывания с помощью движений глаз, ощупывание рукой запрещается. Испытуемый оценивает различие свойств у предъявленных пар фигур от 0 до 9 баллов; 2) испытуемый вслепую рукой ощупывает предложенные пары фигур в специальном экспериментальном ящике и оценивает различие их свойств; 3) предъявляются фигуры, ощупываются с помощью движений руки и глаз (при помощи тактильного и зрительного анализаторов).

Целью данного исследования является экспериментальная проверка эффективности программы «сенсомоторная гимнастика» при обучении подростков в среднеобразовательных школах. Экспериментальное исследование спланировано и проведено в соответствии со вторым планом (Д. Кэмпбелл). Данный план предусматривает проведения тестирования до и после работы, выделение контрольной и экспериментальной групп. Зависимая переменная – перцептивные действия подростков с наличием компьютерной игровой зависимости; независимая – программа «сенсомоторная гимнастика». В качестве экспериментальной группы была выбрана группа подростков с наличием компьютерной игровой зависимости средней и высокой степени ($N=64$), которая в течение шести месяцев принимала участие в реализуемой программе «сенсомоторная гимнастика»



Рис. 1. Пример сенсорных наборов

(приняли участие семь групп подростков). В качестве контрольной группы была выбрана группа подростков с наличием компьютерной игровой зависимости средней и высокой степени ($N=72$), которая не принимала участия в тренинговой программе.

Полученные результаты свидетельствуют, что в ходе проведения формирующего эксперимента у подростков из экспериментальной группы произошло развитие перцептивных действий, внимания, моторики (увеличилось кол-во свойств, определяемых школьниками при восприятии предметов, повысилась точность и правильность определения различий между парами предъявляемых предметов и др.). У подростков из контрольной группы прирост незначителен (различия статистически достоверны при $p \leq 0,01$). У подростков из экспериментальной группы в большей степени по сравнению с подростками из контрольной группы снизился уровень компьютерной зависимости, улучшились перцептивные действия. Правомомерность вывода и выявленных различий подтверждена при помощи статистических критериев Т. Вилкоксона, G – критерия знаков (при $p \leq 0,01$). Эти данные убедительно доказывают эффективность применения разработанной коррекционно-развивающей программы.

Полученные результаты позволяют сделать выводы: 1) подготовленный инструментарий и методические материалы могут использоваться для диагностики и коррекции сенсорных и моторных процессов; 2) были получены статистически подтвержденные результаты, которые утверждают, что применение методики последовательного добавления анализаторов позволило улучшить перцептивные действия подростков, также снизить уровень компьютерной

игровой зависимости. Иначе говоря, произошло восстановление в процессе тренировки нарушенной способности подростка с помощью движений глаз и рук узнавать гибкость предметов окружающего мира и глубину их позиции расположения в пространстве перед его взором; 3) применение методики «Фокус внимания» позволило выявить преобладание видов внимания до и после проведения эксперимента (доля предметного внимания подростка, акцентированность его на социальные объекты значительно возросла); 4) восприятие предметов через нестереоскопические экран телевизора и монитор компьютера следует чередовать с сенсомоторной гимнастикой. В процессе специально организованного обучения при помощи сенсомоторной гимнастики происходит развитие перцептивных действий подростков, а через них – профилактика и коррекция компьютерной игровой зависимости.

На основе полученных данных разработаны психолого-педагогические рекомендации для родителей и специалистов учреждений образования по профилактике и коррекции нарушений перцептивных действий подростков по предупреждению появления компьютерной игровой зависимости, которые внедрены в учебно-воспитательный процесс ряда среднеобразовательных школ Беларуси (г. Брест, Витебск, Гомель и др.).

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ХИМИЧЕСКИЙ КАНАЛ ПОЗНАНИЯ И ОСВОЕНИЯ ВНЕШНЕГО МИРА У РЫБ

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Природные химические стимулы «управляют» поведением многих видов рыб, включая особо ценных представителей семейств осетровых, лососевых и угревых, при пищевом поиске и миграциях. Зная закономерности и пределы хемочувствительности рыб, человек

тоже может с помощью химических стимулов управлять их поведением при разведении в заводских условиях и при естественном воспроизводстве в природных водоёмах. Изучение хемочувствительности рыб – задача комплексная и требует для своего решения междисциплинарного подхода с применением методов психофизики, этологии и аналитической гидрохимии. Однако и результаты таких исследований важны не только для практики, но позволяют также выявить некоторые *когнитивные способности* рыб. На примере молодежи

русского осетра мы установили следующее (Селиванова и Скотникова 2007).

Ощущение и восприятие химических стимулов. Ощущать добавление в воду экспериментального лотка различных природных химических стимулов (ХС) и демонстрировать их «врождённое узнавание» путём простейшей поведенческой реакции: сосредоточения или разрежения группы особей в зоне подачи ХС – осетры, как и ряд других видов рыб, начинают уже со стадии предличинки (до начала активного питания). У мальков осетра (особей, прошедших стадии предличинки и личинки и достигших внешнего сходства со взрослыми рыбами своего вида) различительная хемочувствительность (способность: а) к распознаванию веществ по качеству и б) к различению количеств одного и того же вещества: дифференциальная чувствительность – ДЧ) подчиняется тем же закономерностям, что и у наземных позвоночных. А именно: 1) способность к распознаванию зависит от сигнального значения стимулов и достигает того же предела, что и у человека, собаки и крысы: распознавания оптических изомеров веществ; 2) ДЧ подчиняется закону Вебера, причём ДЧ к многокомпонентным ХС (МХС) на порядок ниже, чем к ординарным ХС, входящим в состав МХС в виде мажорных компонентов. По-видимому, по мере разведения МХС его исходный «химический образ» не сохраняется, т.е. рыбы перестают воспринимать этот стимул как запах первоначального качества, начиная с потери распознавания минорных компонентов смеси. Параметры ДЧ рыб к отдельным аминокислотам (АК) в диапазоне концентраций, при которых рыбы узнают ХС, экологически обусловлены, т.е. тесно связаны с фоновой концентрацией АК в природной воде. При концентрациях тестовых АК выше порога ощущения, но ниже порога распознавания такая связь пропадает.

В отдельной серии опытов было показано, что знак (привлечение, отвращение) и/или интенсивность проявления реакции на одно и то же вещество зависит от уровня пищевой мотивации (степени сытости) рыб. Этот факт указывает на то, что у рыб существует *мотивационная обусловленность восприятия химических стимулов*.

Непроизвольное внимание к химическим стимулам рыбы, как и все живые существа, проявляют в ориентировочном рефлексе – рефлексе на новизну. На его использовании основана наша тестовая методика, включающая в себя как составную часть «habituation-discrimination test» (HDT), который широко применяется и

в этологии, и в когнитивной психологии при изучении способностей высших позвоночных наземных животных и человеческих младенцев распознавать качественно разные стимулы. Мы посчитали, что ощущение новизны может возникать не только при изменении качества, но и количества (концентрации), и, применив собственную версию HDT, смогли впервые определить ДЧ к ХС у водных животных.

Долговременная память к химическим стимулам. Проходным видам рыб, к которым относятся осетровые, лососевые и угревые, свойствен хоминг. По одной из гипотез хоминг основан на импринтинге – запечатлении молодью «химического образа» родного ручья. Предполагается, что при нерестовой миграции взрослые особи находят родной ручей по его «химическому образу», запечатлённому на ранних этапах постнатального онтогенеза и хранившемуся в памяти рыб на протяжении периода их обитания в море. Но есть и альтернативная гипотеза, отрицающая роль долговременной памяти и придающая основное значение в хоминге генетической памяти рыб на запах своей популяции. Независимо от того, какая гипотеза хоминга в итоге подтвердится, *запечатление и последующее вспоминание запахов* некоторых искусственных веществ было показано для осетровых и лососевых (Бойко и др. 1993; Hasler and Wisby 1951).

Проявление у молоди осетра *долговременной памяти на естественные запахи* мы наблюдали сначала случайно, как методический артефакт. При отработке схемы тестирования экстракт из искусственного корма (ЭИК) предъявлялся в конце тестовой серии, т.к. мутный раствор ЭИК вымывался заметно дольше, чем раствор красителя, применяемый для контроля скорости вымывания. Через 5–15 мин (временной интервал зависел от порядкового номера лотка) после предъявления ЭИК рыб кормили естественным кормом (ЕК) – живыми дафниями. Несмотря на такой длительный перерыв между предъявлением ЭИК и кормлением ЕК, запах ЭИК каким-то образом (возможно, за счёт присутствия в лотке следовых количеств его отдельных компонентов) ассоциировался у осетрат с последующим получением ЕК. Если при первом предъявлении осетрята избегали запаха ЭИК, то после 4-х сочетаний предъявления ЭИК с последующим кормлением ЕК произошла полная инверсия знака реакции на запах ЭИК, т.е. он стал привлекать осетрат. При повторных предъявлениях ЭИК через 0,5, 1 и 1,5 месяца его привлекающее действие сохранялось без подкрепления ЕК. В устойчивости

этого случайно выработанного условного рефлекса (УР), по-видимому, «виновата» *долговременная память*. Далее ЭИК в тестовой серии случайно чередовался с другими стимулами, и инверсии исходного отрицательного знака реакции уже не было. Это значит, что вначале такая инверсия была именно следствием изменения сигнального значения ЭИК после 4-кратного подкрепления ЕК. Интересно, что при отсроченном, но адекватном пищевом подкреплении стойкий УР выработался у всех трёх групп рыб, населявших лотки, после 4-х сочетаний. Вместе с тем из сводки работ в монографии Р. Ю. Касимова (1980) известно, что для выработки УР на стимулы другой (не ведущей) модальности у молоди и взрослых особей осетровых рыб требуется, как минимум, а по-рядок больше сочетаний, и без подкрепления реакция на условный сигнал вскоре пропадает,

т.е. приобретённое при обучении сигнальное значение условного стимула забывается.

Итак, приведённые данные о *когнитивных способностях рыб* показывают, что у осетров и других проходных видов-макросматиков химический канал успешно и надёжно служит для познания и освоения внешнего мира.

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ОСОБЕННОСТИ ВЕРБАЛИЗАЦИИ СОВРЕМЕННОЙ КАРТИНЫ МИРА В АНГЛОЯЗЫЧНЫХ ЭЛЕКТРОННЫХ СЛОВАРЯХ НОВЫХ СЛОВ

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Лингвокреативная деятельность языковой личности 21-го века моделируется как собственно лингво-когнитивными процессами и прагматическими установками, так и новыми технологиями, особенностями интеракций с другими членами виртуального сообщества. Специфика языкового творчества на современном этапе предопределяется появлением новых форм электронной коммуникации и, соответственно, новых способов фиксации результатов словотворчества в виртуальном пространстве. В новых условиях глобализации и открытости информации, а также компьютерно-опосредованной коммуникации, построенной на принципах социального конструктивизма и интерактивности, новая лексическая единица оперативно фиксируется в словаре или какой-либо другой базе данных новых слов. Более того, репрезентация нового слова часто является более разносторонней и вариативной, чем в традиционном словаре, т.к. значение (а часто и сама форма слова) уточняется и корректируется другими пользователями. Доступный электронный формат способствует и быстрому распространению нового слова, которое может быть подхвачено другими пользователями, а его успешность

вхождения в узус легко прослеживается по растушему из года в год числу употреблений.

В качестве примера популярных ресурсов новых слов можно привести такие Интернет-проекты, как Word Spy (www.wordspy.com), Urban Dictionary (www.urbandictionary.com). Электронные ресурсы такого рода представляют особую ценность для исследования лексических инноваций, т.к. в них не только оперативно отражается то новое, что появляется в языке, но и часто эксплицитно прокомментирована мотивация и модель создания единицы, приводятся культурологические комментарии, примеры самого раннего и последующих употреблений единицы. Наряду с этими проектами по составлению коллективной базы данных новых слов, популярностью пользуются сайты, ориентированные прежде всего на индивидуальное творчество языковой личности: The Unword Dictionary (www.unwords.com), Pseudodictionary (www.pseudodictionary.com), Verbotomy: The create-a-word game (www.verbotomy.com), PreDictionary: A Lexicon of Neologisms (www.emory.edu/INTELNET/predictionary.html). Сами названия подразумевают, что данные ресурсы посвящены искусству создания новых слов и понятий, расширению моделей словообразования, т.е. это не столько фактическая инвентаризация, сколько проективное описание языка, прогнозирующее и моделирующее его будущее состояние.

Анализ вышеназванных электронных ресурсов показал, что фиксируемые пользователями новые слова и выражения реже создаются для того, чтобы нейтрально и беспристрастно отражать новые реалии, артефакты, концепты, требующие объективации (ср. *a social media ninja* – «someone who uses social media extensively to promote a company's or their own services» [www.urbandictionary.com], *to defriend* – «to remove a person from one's list of friends on a social networking site») [www.wordspy.com]. Чаще всего вербализуются целые ситуации, смешанные чувства и эмоции, специфика восприятия окружающего мира (см. *tracknowledgy* – «The uneasy comfort that comes from knowing that your family, friends, the police, the taxman, and every marketer in the world, are using the newest technology to track your every move.» [www.verbotomy.com].)

Структурообразующая роль оценки в процессах словотворчества обусловлена тем, что «сознание начинается с формирования прагматических структур, обеспечивающих полезностную оценку, ценностную ориентацию и оптимальное реагирование на среду» (Никитин 2007: 692). Анализ предлагаемых пользователями дефиниций для рубрики «Make up a word to fit the definition» показывает, что вербализация современного мира пользователями Интернет часто основывается на критическом, неоднозначном восприятии окружающей действительности:

DEFINITION: The act of sitting at the computer surfing the world wide web until your body goes numb.

DEFINITION: The people who race to book the limited window seats on an aircraft, who only then either read, fall asleep or pull down the shade so that no one sees the view!

DEFINITION: The word for idiotic inventions like Spring-Loaded Faucets and Chinese Apple-Peeling Machines or Ultrasonic Plug-In Rodent Repellers.

DEFINITION: The rampant fear of lawsuits which has led to the stupid application of WARNING labels on everything we purchase. [www.verbotomy.com].

Особенность компьютерной неологии и неологии состоит также и в том, что в условиях

возможности оперативной фиксации слова в электронном словаре любым индивидуальным пользователем Сети отчасти стирается грань между типами новых слов – вошедшими в узус неологизмами, потенциальными словами (новообразованиями, потенциально заложенными продуктивными способами словообразования) и окказионализмами, характеризующимися, как правило, функциональной одноразовостью. В онлайн-словари и базы данных пользователи могут вносить не только собственно неологизмы – новые слова, уже относительно широко употребляемые в языке, но и те, которые возникли совсем недавно и не успели еще закрепиться в какой-либо сфере употребления, или же слова, предложенные в данный момент пользователем именно для расширения словаря, а не в качестве одноразовой единицы.

В связи с этим встаёт вопрос об уточнении типологии новых слов. Внимания заслуживает предложенный М. Эпштейном в 2003 г. термин протологизм (от греч. *protos*, первый, начальный + *logos*, слово), который уже получил распространение в английском языке (protologism) и отличается от неологизма степенью внедренности слова в язык. По определению самого автора термина, – это новое слово, предложенное кем-либо для введения в язык, но еще не нашедшее применения у других авторов, не закрепившееся в качестве неологизма, это так называемый зародыш слова как лексической единицы языка (Эпштейн, 2006).

На наш взгляд, распространение и популярность англоязычных интерактивных сетевых проектов по созданию новых слов, стимулирующих создание протологизмов для номинирования ещё необъективированного участка окружающей действительности, является важным показателем творческой и когнитивной активности современной языковой личности.

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ПОСТНЕКЛАССИЧЕСКАЯ КОГНИТИВНАЯ ПЕДАГОГИКА В СЕТЯХ АУТОПОЭЗИСА

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В инновационной педагогике, столь модной в настоящее время, часто и много говорят об инструментальной стороне образования, используя понятия средств, методик и технологий обучения. Рассматриваются особенности их применения в тех или иных условиях, оценивается педагогическая эффективность, обсуждаются достоинства и недостатки. Считается, что основные проблемы обучения связаны с недостаточным внедрением компьютерных технологий, обучающих программ и мультимедийных сред. При этом порою забывается то, что эти темы отражают только внешние формы организации среды обучения и учебной коммуникации, сама же суть процессов научения остается в стороне. Понимание того, что ученик является познающей системой, непрерывно порождающей и модифицирующей определенную систему увеличивающих и развивающих (а иногда и снижающих) его когнитивные и человеческие возможности средств, часто ускользает от внимания исследователей процесса обучения. В игнорировании динамического характера межсистемных сетевых взаимодействий в среде обучения заключается основная проблема классической педагогики, построенной на информационном подходе и понятиях прямой коммуникативной интерактивности, в рамках которых только педагог создает технологию, форму и содержание педагогического воздействия. При этом конструирующая познавательная активность ученика в отношении его когнитивных инструментов и учебного содержания обычно не рассматривается.

Внедрение в педагогику и психологию в последнее десятилетие методологии постклассической и постнеклассической науки (Степин В. С. 2007) привело к новому пониманию процессов обучения и формирования когнитивных и личностных структур человека (Сергеев С. Ф. 2009). Появилось и укрепляется направление педагогики, которое можно назвать *постнеклассической ветвью когнитивной педагогики* (Сергеев С. Ф. 2011). В ней по аналогии с классической когнитивной педагогикой человек рассматривается как познающая мир система, но в постклассических представлениях это система самоорганизующаяся в пределах своего опыта, а в постнеклассических – саморазвивающаяся

историческая система аутопоэтического типа, испытывающая ориентирующее влияние со стороны учебной коммуникации, возникающей в обучающей среде и тоже проявляющей свойства самоорганизации.

Основные вопросы, решаемые когнитивной педагогикой, – как, с помощью и посредством чего человек может эффективно исследовать мир, организовать себя, реализовать достойную историю своей жизни? Как вырастить эффективную когнитивную систему ученика? Задача педагогического процесса – создание условий для эффективной когнитивной самоорганизации человека, оснащение его универсальными инструментами для решения жизненных задач.

В когнитивной педагогике, в отличие от поведенческой ориентации, свойственной традиционным школам, особое внимание уделяется познавательным структурам и инструментам человека, способам их организации и развития посредством учебной коммуникации (Холодная М. А., 2008, Сергеев С. Ф. 2010).

Анализ существующих традиционных вариантов когнитивной педагогики показывает, что все они в значительной мере декларативны, так как используют при объяснении феноменов научения редукции классических взглядов на процессы формирования когнитивной организации человека, связанные с физиологическими и биологическими представлениями о росте и развитии психических структур. В них не учитываются эффекты межсистемных взаимодействий между системами разной природы, возникающих в процессе учебной коммуникации между учеником и учителем. Несмотря на очевидную пользу для теории обучения идей развития и саморазвития человека, в классических вариантах педагогики развития (ее когнитивном варианте) часто упускается из вида конструирующая активность ученика.

Когнитивный подход требует особого внимания к инструментальной сфере педагогической среды, под которой понимаются не только физические и социальные факторы обучения, но и внутренняя активность учеников, порождающих обучающую среду, включающую метаинструменты и способы достижения субъективных целей при решении формально-заданных учебных задач. Заметим, что метаинструменты – это динамические психические структуры, создаваемые в психофизиологической структуре человека для решения конкретной задачи, и они в процессе эволюции

должны замещаться более универсальными когнитивными инструментами. Метаинструмент – это этап эволюции той или иной когнитивной способности инструментальной характеристики познавательной системы человека. При этом идет процесс оценки инструмента в каждый текущий момент времени, его апробация и выбор следующего этапа эволюции при разрушении предыдущего или неэффективного его варианта. Возникает эффект системного дрейфа взаимодействующих аутопоэтических систем, образующих контур обучающей среды, выражающийся в наблюдаемых формах процесса обучения. Следует заметить, что когнитивная организация отражает свойства целостной структуры познания человека, включающей не только инструментальные, но и содержательные компоненты психики, вовлекаемые в процессы организации и самоорганизации человеческого

знания, существующего в виде эмерджентного свойства психофизиологической организации человека, включая циркулирующий в ней информационный контент.

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МЕНТАЛЬНЫЕ МЕХАНИЗМЫ СОЦИАЛЬНЫХ ВОЗДЕЙСТВИЙ (НА ПРИМЕРЕ ПОНИМАНИЯ РЕКЛАМЫ ДЕТЬМИ 3–6 ЛЕТ)

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Вопрос о социальной природе модели психического тесно связан с теми социальными воздействиями, которые дети воспринимают в процессе социализации. В данной работе изучается проблема возможностей понимания социальных воздействий детьми и что определяет их эффективность в процессе социализации. Социальные воздействия являются важнейшим источником социализации, при этом не менее значимы особенности ментальной организации детей, как универсальные (возрастные аспекты понимания), так и индивидуальные (особенности понимания, индивидуальные установки, стереотипы, особенности обработки информационных процессов), которые выступают своеобразным фильтром, ограничивающим понимание воздействий и их интерпретацию.

Одним из мощных и реально действующих социальных воздействий является реклама, особенно телевизионная. Целью рекламы и пропаганды, несмотря на различные способы ее достижения, является воздействие на убеждения людей, чтобы добиться желаемого поведения. Дети обладают огромной притягательной силой для рекламы, так как зачастую дети в возрасте до 12 лет определяют семейный расход. Мы

предполагаем, что по мере прогрессивного развития модели психического, лежащего в основе понимания мнений и способов их изменений, будет происходить и рост понимания рекламных сообщений как частного вида социальных воздействий. Поэтому понимание рекламных сообщений в контексте современной теории модели психического, позволяющей концептуализировать понимание, будет принципиально новым подходом для изучения ментальных механизмов социальных воздействий, а в частности, понимания рекламных сообщений. Многие авторы признают, что наиболее адекватным для понимания когнитивных механизмов понимания рекламы может стать подход «Модель психического» или Theory of Mind, но в настоящее время подобные работы отсутствуют.

В предыдущих исследованиях понимания психического у детей дошкольного возраста с типичным развитием и при расстройствах аутистического спектра автором с сотрудниками были получены конвергирующие результаты развития понимания разных феноменов модели психического. Были выделены два уровня развития модели психического, которые определяют особенности понимания ментальных состояний у детей дошкольного возраста: уровень агента, характерный для детей 3–4 лет, и второй уровень наивного субъекта, характерный для детей 5–6 лет. Анализ развития понимания

ментальных состояний позволил выделить тип моделей: единичные, разрозненные репрезентации – у детей 3 лет, ситуативные модели у детей 4 лет и внеситуативные – у детей 5–6 лет, что позволяет говорить о становлении базовой концептуальной основы модели психического.

Гипотеза данной работы состояла в предположении, что понимание телевизионной рекламы детьми 3–6 лет тесно связано с развитием определенного уровня модели психического. Для проверки гипотезы были использованы три блока задач. Первый блок направлен на оценку развития модели психического. Он состоял из трех задач, которые являются ключевыми для модели психического и необходимыми для понимания социальных воздействий: задача на понимание обмана, задача на понимание неверного мнения (Салли-Энн тест) и задача на распознавание четырех базовых эмоций (по фотографиям лиц и пиктограммам). Второй блок задач был направлен на понимание детьми социальных взаимодействий с использованием 3-х нарративов, отражающих типичные взаимодействия: ребенок-ребенок, ребенок-близкий взрослый, ребенок – чужой взрослый.

Для изучения понимания социальных воздействий были подобраны три типа рекламных сообщений, видеоролики (по два примера на каждый тип): коммерческая реклама детских продуктов питания, адресованная взрослым, но с детскими персонажами (Фруто-няня и Киндер-делис), реклама игрушек, адресованная детям и взрослым (Лего-сити и Бэби – Анабель) и социальная реклама широкой адресации, пропагандирующая семейные ценности (Семья и Дети-сироты). Ко всем задачам были сформулированы вопросы, отражающие степень понимания содержания, целей и причин поступков персонажей и их эмоциональных реакций. Кодирование ответов детей проводилось от 0 до 3 (от отсутствия ответа, верного, но без понимания причин, верного с частичным пониманием и верного с полным пониманием причин поведения персонажей). Обязательным условием исследования является оценка уровня психометрического интеллекта. Применялся тест Д. Векслера для детей, WPPSI (для детей от 3 до 7 лет 3 мес.). Участниками исследования были 70 детей 3, 4, 5 и 6 лет. Обработка результатов исследования осуществлялась с помощью статистического пакета «SPSS 18», анализ связей между пониманием рекламы и моделью психического проводился с помощью коэффициента корреляции Спирмена. Значимость различий в понимании рекламы и модели психического между возрастными группами определялась по критерию

углового преобразования Фишера. Анализ полученных результатов позволяет сделать следующие выводы:

1. Наблюдается возрастная динамика понимания рекламы в дошкольном возрасте. Детям 3–4 лет сложно понять смысл и сюжет рекламных роликов. В большинстве случаев дети вычлениают отдельные части сюжета без полного понимания увиденного или констатируют увиденные отрывки.
2. К 5–6 годам дети хорошо понимают смысл рекламы, распознают эмоции персонажей, могут объяснить их поведение. В этом возрасте дети способны не только понять смысл увиденной картины, но и раскритиковать, приводя верные доводы.
3. Понимание рекламы у детей 3–4 летнего возраста ограничивается недифференцированным, ситуативно-зависимым пониманием сюжета, чувств и желаний персонажей, недифференцированной оценкой их поведения.
4. В 5–6-летнем возрасте возможности детей в понимании рекламы существенно возрастают, как возрастает и их способность понимать и сравнивать модели психического свою и Другого.
5. Понимание телевизионной рекламы у детей 3–6 лет подтверждает гипотезу о существовании взаимосвязи возможностей этого понимания с развитием модели психического.
6. Модель психического является необходимым условием понимания социальных взаимодействий, таким образом, понимание рекламы в дошкольном возрасте развивается в соответствии с развитием модели психического, демонстрируя такую же уровневую организацию.
7. Структура, лежащая в основе понимания рекламы, изменяется с возрастом: от необходимой тесной взаимосвязи составляющих модели психического и различных рекламных сообщений, что отражает ситуативно-зависимую структуру ментальной организации, – к ситуативно-независимой, предполагающей большую доступность в понимании.
8. Сюжеты социальной рекламы «Семья» и «Дети-сироты» становятся понятными детям, только начиная с 5–6 летнего возраста, поскольку предполагают возможность сравнения различных ментальных моделей, ситуативно не представленных в воспринимаемом сюжете. Понимание коммерческой рекламы в данном возрасте существенно отличается от младших детей.

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К ВОПРОСУ О КРАТКОВРЕМЕННОЙ СТАДИИ ВО ВРЕМЕННОЙ СТРУКТУРЕ ПАМЯТИ

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В настоящее время доминирующей концепцией памяти является теория трехступенчатой структуры (Аткинсон, Шифрин, 1998 [1968]), согласно которой информация поступает в долговременное хранилище только после анализа и селекции, осуществляемых в кратковременной памяти. Практически в это же время высказывается альтернативная идея сплошной записи (Penfield, 1975), которая по своей сути близка к феномену запечатления, детально описанному Конрадом Лоренцем для раннего онтогенеза (Lorenz, 1935). Необходимо подчеркнуть, что во всех случаях наблюдатель судит об особенностях памятного следа исключительно по процессу воспроизведения. Согласно современному представлению, роль кратковременной памяти при воспроизведении памятного следа сводится к актуализации знания, существующего в долговременной памяти (Аткинсон, Шифрин, 1998). Следует отметить, что еще в 1866 г. (Сеченов, 2001) в отношении воспроизведения было сформулировано представление, согласно которому этот процесс по своей сущности и процедуре ничем не должен отличаться от образования впечатлений. Оставаясь невостребованной в течение целого столетия, эта идея в виде процесса реконсолидации памятного следа при его реактивации вновь была высказана в 70-х гг. (Lewis, 1972), но уже в рамках когнитивной парадигмы. Однако необходимо отметить, что на сегодняшний день мы не имеем четких фактов о том, каким образом фиксируется информация, в чем состоит селекция, что именно хранится в виде памятного следа и каким образом происходит извлечение.

В связи с этим, используя семиотический подход, представляло интерес оценить особенности воспроизведения памятного следа, индивидуальные аспекты и влияние перерыва на характер функционирования памяти.

Для решения этих вопросов в качестве экспериментальной ситуации животным (мыши линии BALB/c, крысы линии Вистар) предлагалась проблемная пищедобывательная ситуация в многоальтернативном лабиринте. Все экспериментальное пространство разбивали на зоны и каждой из них присваивали свой знак. В результате запись поведения животного в опыте представляла собой текст и, таким образом,

было возможно проследить динамику формирования решения, характер его воспроизведения в зависимости от индивидуальных особенностей животного, в условиях переделки, после перерыва, а также в случае, когда первая проба совершалась в лабиринте меньшего объема. Оказалось, что однократной маршрутной реализации было достаточно для того, чтобы она была не только зафиксирована, но и активно включалась в структуру конечного решения, хотя ее присутствие мешало реализации принципа минимума действия (Никольская, Бережная, 2011). Поскольку полученный эффект не зависел ни от времени экспозиции, ни от частоты и факта получения подкрепления, это позволяет нам рассматривать данный феномен как процесс, осуществляемый по типу импринтинга. Факт устойчивого воспроизведения «бесполезной» информации ставит под сомнение обязательность этапа селекции в кратковременной памяти при переходе информации в долговременное хранение (Аткинсон, Шифрин, 1998).

Исследования функционирования готового памятного следа показали, что у всех животных, независимо от видовой принадлежности, на этапе сформированного навыка воспроизведение структуры решения в пределах каждого опыта имело четкую закономерность. В пределах первых одной-двух проб поведение животных имело генерализованный характер, несмотря на стереотипность воспроизведения минимизированной маршрутной реализации решения в предыдущем опыте. При этом характер воспроизведения во многом определялся индивидуальными особенностями возбудительно-тормозных нервных процессов. Выяснилось, что устойчивое воспроизведение памятного следа у животных уравновешенного типа наблюдалось только после фазы припоминания, независимо от числа предшествующих проб. Особенно ярко феномен воссоздания знания был выражен у неустойчивого типа с преобладанием возбудительных процессов: в течение опыта у животных можно было неоднократно наблюдать распад целостного решения на фрагменты, которые снова объединялись в целостную структуру правильного решения. Кроме того, при анализе фазы припоминания выяснилось, что чем больше у животного было сформировано следов, тем более длительным было восстановление текущего решения и хаотичным оказывалось поведение в первых пробах за счет извлечения большего числа фрагментов ранее сформированных следов.

Таким образом, полученные данные ставят вопрос о пересмотре роли кратковременной стадии во временной структуре памяти. Высказывается представление о том, что впервые воспринятая ситуация сразу фиксируется по принципу импринтинга в долговременном хранилище без ее селекции. При последующем столкновении с той же ситуацией воспроизведение памятного следа фактически представляет собой его воссоздание в режиме так называемой кратковременной памяти. Фактически это означает, что памятный след существует как целостное явление только в рамках оперативного функционирования ЦНС. В современном прочтении эти идеи наиболее близки к моделям коннекционистского типа (McClelland, Rumelhard, 1981), в силу того, что процесс извлечения рассматривается авторами не как

обращение к «готовым» репрезентациям, а как повторное создание знаний.

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ОСОБЕННОСТИ ПРИПИСЫВАНИЯ В УСЛОВИЯХ ВНЕШНЕГО ДАВЛЕНИЯ

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Исследования когнитивных процессов понимания и интерпретации своего поведения приобретают все больше мультидисциплинарный характер.

Во многих сферах общественной жизни, на выборах, например, или в суде присяжных, применяется способ решения конфликта между людьми посредством использования «власти большинства», потому что большинство представляет собой «коллективную мудрость», а не решение одного человека. Однако превосходство группы может исчезнуть, если присутствует групповое давление. Нежелание остаться в одиночестве может сделать более привлекательным желание следовать мнению большинства, чем придерживаться собственных убеждений. И если взгляды других людей могут реально повлиять на то, как воспринимается субъектом окружающий мир, то истина решения большинства остается в этом случае под вопросом.

В рамках гранта РГНФ мы провели пилотажное *экспериментальное исследование* для выявления атрибутивных процессов после проявления субъектом навязанного поведения. Суть эксперимента заключалась в следующем. Нами была организована дегустация питьевой воды. Экспериментаторы предлагали прохожим

попробовать и оценить на вкус два вида питьевой воды: минерализованную и неминерализованную. На самом деле предлагаемая нами вода в двух графинах была одинаковой, что подтвердила контрольная группа испытуемых, которым предлагалось попробовать воду из двух графинов без какой-либо инструкции. Причем в процессе подготовки и проведения эксперимента отдельно выделялись субъекты, демонстрирующие конформное, независимое и неконформное поведение. Позиция неконформизма выявлялась следующим образом. Если испытуемый при дегустации «минерализованной» и «неминерализованной» воды говорил, что вода из двух графинов одинаковая, мы предлагали ему стакан питьевой воды из третьего графина, в котором действительно находилась питьевая вода другой марки, и просили субъекта сравнить три образца. Испытуемые с независимым поведением, несмотря на давление подставной группы, говорили, что вода первого и второго образца одинаковая и отличается от воды третьего образца. Испытуемые, демонстрирующие неконформное поведение, говорили, что вода во всех образцах одинаковая, т.е. мнение таких людей всегда было противоположным мнению подставной группы.

Результаты анализа полученных данных пилотажного эксперимента показали и подтвердили другие многочисленные исследования конформности, что статистически большее количество испытуемых, принявших участие в

эксперименте, демонстрировали конформное поведение. Однако задачей нашего исследования было выявление не столько конформного поведения, сколько когнитивных процессов понимания и интерпретации своего поведения в данной ситуации. Для того, чтобы выявить процесс атрибуции, мы после экспериментальной ситуации дегустации проводили с испытуемыми опрос, перед которым им сообщали, что вода в двух образцах была одинаковой, и просили прокомментировать свое поведение.

Нами было определено, что статистически большее количество испытуемых в ситуации, как мы полагаем, для себя неожиданной и неприятной, проявляли **обстоятельную атрибуцию** (по классификации Г. Келли для каузального приписывания, 1984). В этом случае субъекты объясняют свое поведение возможным влиянием физиологических («так «работают» рецепторы»), физических («солнце нагрело один кувшин больше, чем другой, и это повлияло на вкус») и других подобных факторов.

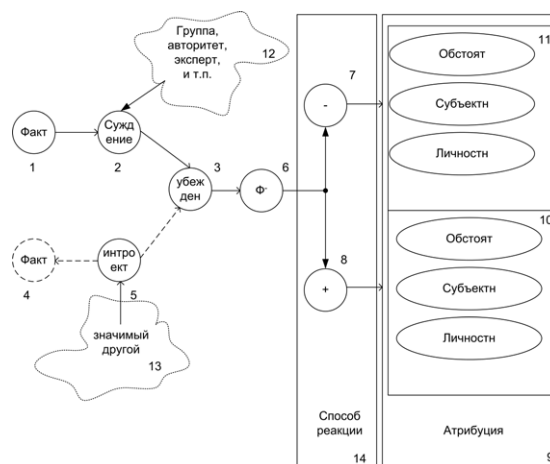
Достоверно меньше субъектов демонстрировали **субъектную атрибуцию**, когда причина проявленного поведения виделась в себе («что-то обманулся я в своих ощущениях», «я виноват, не пробовал воду, а слушал, что говорят другие, – буду знать»). Также немного было тех участников эксперимента, которые продемонстрировали **личностный тип приписывания** («так не мне одному казалось – другие (*подставная группа*) тоже чувствовали различие во вкусе», «это вы специально обманули», «вы плохо вымыли кувшины из-под другой воды»).

Полученные результаты можно объяснить тем, что человек склонен защищать свое «Я». Мы полагаем, что эта защита связана **механизмами когнитивных процессов**.

Мы полагаем, что субъект строит свое суждение на каком-либо истинном факте. Его суждение может искажаться из-за влияния группы на субъекта или, например, из-за влияния авторитетной личности. Но субъективно человек полагает, что это суждение истинно, поскольку основывается на факте. На основе сформированного суждения у субъекта формируется убеждение. Если же кто-то или что-то сталкивает субъекта с тем, что его убеждение ошибочно, что оно опирается на ложно сформировавшиеся суждения (в вышеописанном эксперименте интервьюеры сообщали испытуемому, что вода, о которой испытуемый уже сказал, что она разная, на самом деле одинаковая), то у человека возникает какое-либо эмоциональное отношение к ситуации, которое порождает ответную реакцию.

Рассматривались два вида такой реакции.

1) человек субъективно начинает либо **отрицать возможность того, что его убеждение ошибочно** (объясняет свое поведение либо обстоятельствами («солнце неравномерно прогрело кувшины с водой, поэтому вкус воды ощущается как разный»), либо личностью другого («плохо помыли графины, поэтому в одном образце ощущался какой-то привкус»), либо собственными, субъектными, особенностями («я тонко чувствую – вода точно разная»)).



2) человек субъективно **соглашается с возможностью того, что он ошибся**. В этом случае он также начинает объяснять свое поведение различными видами каузальной атрибуции (по Г. Келли), но из другой позиции. Субъект либо начинает приписывать причины своего поведения обстоятельствам («пить хотелось – не почувствовал»), либо личностью другого («группа уговорила»), либо своими особенностями («у меня плохо с оценкой ощущений»).

Мы полагаем, что способ реакции субъекта определяет **совокупность психосоциальных факторов**, рассмотренных Михайловой И. В. в 2009 г, из которых нам представляется возможным особо выделить: когнитивную простоту-сложность субъекта, локус контроля, стабильность, независимость и уровень его самооценки, а также просвещенность индивидуума.

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КУЛЬТУРНЫЕ ИСТОКИ ЧЕЛОВЕЧЕСКОГО ПОЗНАНИЯ: КОНЦЕПЦИЯ М. ТОМАЗЕЛЛО

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Рассматривая основные положения концепции М. Томазелло в его работе «Культурные истоки человеческого познания», увидевшей свет в 1999 году, не переведённой на русский язык и не опубликованной в России, мы сосредоточили внимание на положениях о происхождении человеческого познания и роли культуры в когнитивных процессах.

Автор утверждает, что корни способности индивида к восприятию основанной на символе культуры и вид психологического развития, которое рассматривается с этой точки зрения, относятся к группе уникальных человеческих познавательных способностей, которые появляются рано в человеческом онтогенезе. Описывая специфические видовые человеческие когнитивные способности, которыми не обладает ни один другой вид животных, включая высших приматов, он утверждает, что человеческие культурные традиции и артефакты аккумулируют в себе модификации, накопленные в течение длительного времени, чего не может сделать ни один другой вид животных. И это, по мнению Томазелло (1999: 4–5), позволяет говорить о возможности совокупной культурной эволюции вида *Homo Sapiens*.

При этом такие культурные артефакты, как идеи, традиции, способности и другие, передаваемые от поколения к поколению, имеют тенденцию развиваться. Феномен «углубления» определенных артефактов, доставшихся от «предшествующей» культуры, каждым поколением Томазелло образно именует «эффектом храповика» и полагает, что данный эффект включен в совокупный естественный отбор, воздействующий на культуру более, чем генотип или фенотип. Таким образом, Томазелло вводит новое для культурной психологии и когнитивной науки понятие. Концепция Томазелло в определенном смысле противостоит идеям некоторых других учёных, к примеру, Хомского и Пинкера (2004; 11–15). Теориям врождённости и научения он противопоставляет другую дихотомию: между человеком и культурной линией развития, содержащуюся в концепции Вygотского (1991; 5–18). Томазелло настаивает на том, что когнитивное познание есть некое «магическое ядро», которое отличает человека от примата.

Ребёнок, имеющий в распоряжении большее, по сравнению со своими сверстниками, количество когнитивных продуктов, стоит «на плечах гиганта», увеличивая поле своего познания. Человек, рождённый на необитаемом острове и оставленный там, чтобы жить в одиночестве, или страдающий аутизмом, лишен «разделённого внимания», с которым приходит понимание и эффективность языкового становления. Выросший в изоляции не имеет этих «плеч» в силу невозможности совместной деятельности с взрослым и идентификации с ним. Томазелло полагает (и данные предположения имеют исторические примеры «Маугли»), что такой ребёнок на некоторой более поздней стадии своего развития был бы не способен к аналитическому мышлению, имел бы скудные математические способности, вряд ли задумывался бы о психических состояниях других людей и о морали, поскольку они появляются, главным образом, в диалогических взаимодействиях ребенка с другими людьми.

Человек, как вид – представитель «Модели двойного наследования» (The Dual Inheritance Model), т.к. нормальное для человека развитие включает в себя в равной мере и биологическое, и культурное наследование. Человеческое культурное наследование опирается на две, образующие неразрывную пару, колонны, а именно – *социогенез*, средствами которого созданы большинство артефактов и культурных практик, и *культурное обучение*, средствами которого эти творения усваиваются развивающимся поколением.

Культура, по мнению Томазелло, есть уникальная «онтогенетическая ниша» для человеческого развития. Автор рассматривает два направления, в которых культурная окружающая среда намечает контекст для культурного развития детей.

Во-первых, как «когнитивный габитус» или внешняя оболочка, что есть вовлечение ребёнка в нормальные культурные практики той среды, в которой ребёнок растёт. Габитус, внутри которого ребёнок родился, детерминирует виды социальных взаимодействий, которые он будет иметь, совокупность материальных артефактов, которые будут в его распоряжении, события, определенный жизненный опыт, обстоятельства, с которыми он может столкнуться, совокупность выводов и умозаключений, которые он сделает относительно окружающей реальности. Соответственно, габитус имеет

непосредственное влияние на когнитивное развитие именно как «сырьё», с которым ребёнку предстоит работать.

И, во-вторых, как источник активного обучения, происходящий от взрослых. Томазелло, следуя некоторым предшествующим теориям, вводит термин скаффолдинг, т.е. поддержка.

Так, примерно к 9 месяцам ребёнок до некоторой степени готов участвовать в культурном мире. До этого, в младенческий период, происходило то, что в рамках этой концепции называется двоичной имитацией поведения — имитацией, рождающейся в основном из тесного телесного и эмоционального контакта между взрослым и ребёнком (*face-to-face dyadic mimicking of behavior*). В девятимесячном возрасте происходит настоящая революция: ребёнок начинает подражать не только действию, он воспроизводит целенаправленные действия взрослого на внешний объект, то есть двоичная имитация перерастает в троичную, в которую вплетены новые элементы. От сенсомоторного подражания происходит переход к имитации целей взрослого и тех поведенческих средств, с помощью которых эти цели могут быть

достигнуты. Ребёнок обращается к взрослому за тем, чтобы получить некое соглашение, регламентирующее то, как «Мы» используем артефакт «Для». Символическая игра в в этом контексте есть полностью уникально человеческая форма поведения.

Концепция Томазелло — элегантно выстроенный мост между эволюционной теорией и культурной психологией. Фундаментальным основанием этой интересной, убедительной и последовательной работы служат положения культурно-исторической школы Выготского. Практическую значимость научных работ Томазелло ещё предстоит оценить: они являются крепкой теоретической опорой созданию развивающей модели как «онтогенетической ниши» для детского развития.

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ИДЕНТИФИКАЦИЯ ТИПА ИЗМЕНЕННОГО СОСТОЯНИЯ СОЗНАНИЯ НА ОСНОВЕ ОСОБЕННОСТЕЙ ВЕРБАЛЬНОГО И НЕВЕРБАЛЬНОГО ПОВЕДЕНИЯ ЧЕЛОВЕКА

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Изучение измененных состояний сознания является одной из актуальных задач, предполагающих объединение усилий специалистов, работающих в разных областях знания. В работах Dirven 1997, Fiedler 1991, Дремов, Семин 2001, Медведев 1982, Спивак 1998 и др. указывается на целый ряд причин социального, экономического, экологического характера, определяющих устойчивый рост количества людей, систематически находящихся в ИСС небольшой глубины. Данные состояния, таким образом, во многом обуславливают особенности жизнедеятельности людей в целом, в том числе особенности их речемыслительной деятельности. Важно подчеркнуть, что, вслед за Д.Л. Спиваком (1998: 8), измененные состояния сознания (ИСС) рассматриваются не как болезненные, патологические, а как особые

психические состояния, возникающие под воздействием не вполне обычных факторов.

Предметом данного сообщения является описание лингвистических методов изучения ИСС и возможности использования полученных результатов для уточнения границ различных типов ИСС, оказывающих влияние на вербальное и невербальное поведение человека.

С одной стороны, вследствие того, что био- и психофизиологические процессы недоступны для непосредственного наблюдения, выявление типов ИСС в рамках собственно лингвистических исследований затруднено: идентификация психологического состояния говорящего в основном базируется на знании общих закономерностей влияния ИСС на поведение человека, анализе ситуации общения, исследовательской интуиции. С другой стороны, именно лингвистический подход позволяет использовать обширные базы данных, в то время как эксперименты по изучению речевых характеристик под воздействием электрической/фармакологической стимуляции или в экстремальных ситуациях

связаны со значительными ограничениями материала для анализа.

Основными задачами лингвистических исследований являются а) выделение типов ИСС, оказывающих непосредственное влияние на особенности реализации элементов на всех уровнях языковой системы; б) формализация тех внешне наблюдаемых признаков, по которым исследователь-лингвист может как фиксировать сам факт наличия ИСС, так и дифференцировать типы ИСС без обращения к лабораторным психо-, био- и нейрофизиологическим тестам; в) создание классификаций языковых элементов, обнаруживающих корреляционные связи с типами ИСС; г) разработка алгоритмов идентификации типов ИСС по наблюдаемым вербальным и невербальным характеристикам. Подробнее пути решения данных задач описаны в Синеокова 2009.

Выделение релевантных целям исследования типов ИСС является исключительно важной задачей, от успешного решения которой во многом зависит сама возможность установления искоемых корреляционных связей. Существующие в рамках других научных дисциплин классификации ИСС, основанные на их количественных и качественных характеристиках, создавались под конкретные цели и, как это часто бывает, не могут использоваться в «готовом» виде. Так, например, если различные аффективные состояния (восторг, ярость и др.), входящие в состав ИСС, обнаруживают корреляты на фонетическом и лексическом уровнях, то на синтаксическом уровне они манифестируются одинаково. Осмысление специфики реализации синтаксических структур при ИСС показало, что при общей тенденции – деформационном характере порождаемых конструкций – наблюдается ярко выраженная их специфика, зависящая, по-видимому, от деструктивного (деформирующего) или конструктивного (благоприятного) характера влияния ИСС на речемыслительные процессы. Соответственно, были выделены три состояния: состояние *диссоциации*, состояние *эвстресса* и пограничная фаза перехода от состояния диссоциации на промежуточную программу адаптации – *поисковое* состояние.

Для решения второй задачи были систематизированы и классифицированы внешне наблюдаемые признаки выделенных типов ИСС: особенности мимики, позы, жеста, перемещения, голосовых характеристик, тактильного и визуального контакта, манипуляций с предметами, вегетативных характеристик. Всего было выделено 82 классификационных признака, на основе которых разрабатывался алгоритм идентификации. В базе данных из 2915 элементов

прогнозом было охвачено 97,4%, при этом 92,4% из них были идентифицированы правильно.

При решении следующей задачи в основу классификации синтаксических структур было положено представление о деформированном характере реализуемых при ИСС форм, описание которых основывалось на анализе структурных и функциональных отличий реализуемых признаков от признаков ядерного предложения. Было выделено 39 классификационных признаков, которые по отдельности или в сочетаниях могли характеризовать конструктивные особенности любого высказывания. В выборке из 1000 высказываний удалось правильно определить тип ИСС говорящего в 77% случаев, из них правильно – 69%. Следует подчеркнуть, что прогнозирование проводилось исключительно на основе структурных характеристик высказывания, без учета фонетической и лексической специфики.

Еще одним, дополнительным, этапом работы было сравнение результатов независимых прогнозов типа ИСС по вербальным и невербальным характеристикам, позволившее сделать ряд важных выводов. Во-первых, соответствие результатов идентификации подтвердило правильность положенных в основу исследований предположений, подтвердить объективность обоих алгоритмов и классификаций. Во-вторых, сопоставление результатов идентификации типов ИСС по двум критериям позволило выявить возможные расхождения и уточнить границы разных типов ИСС. В-третьих, независимо от лабораторных биохимических и психофизиологических тестов такого рода сопоставление позволяет определить сущности, обладающие характерными для ИСС свойствами (полнотой и альтернативностью набора) и потому допускающие интерпретацию тождественности с ИСС.

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ПРИНЦИП МИНИМАЛЬНЫХ СОВМЕСТНЫХ УСИЛИЙ ГЕРБЕРТА КЛАРКА: ЗА И ПРОТИВ

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Принцип минимальных совместных усилий – одно из основополагающих понятий **совместной модели** установления референции в диалоге, был впервые сформулирован в работе Clark & Wilkes-Gibbs 1986. Верность этого принципа подтверждается анализом референциальных выражений, используемых участниками эксперимента для описания **танграмм** – фигурок из китайской головоломки, каждая из которых состоит из семи частей особым образом разрезанного квадрата. Перед обоими участниками, которые не видели друг друга, был набор из 12 танграмм (см. рис. 1), причем перед Инструктором (=И.) они были расположены в одном порядке, а перед Раскладчиком (=Р.) – в другом, так что целью И. было объяснить Р. свой порядок. У каждой из восьми пар испытуемых было шесть попыток, в каждой из которых набор фигурок оставался таким же, а менялось только их взаимное расположение; в ходе эксперимента собеседники не менялись ролями – один из них всегда выступал в роли И., а второй – в роли Р.

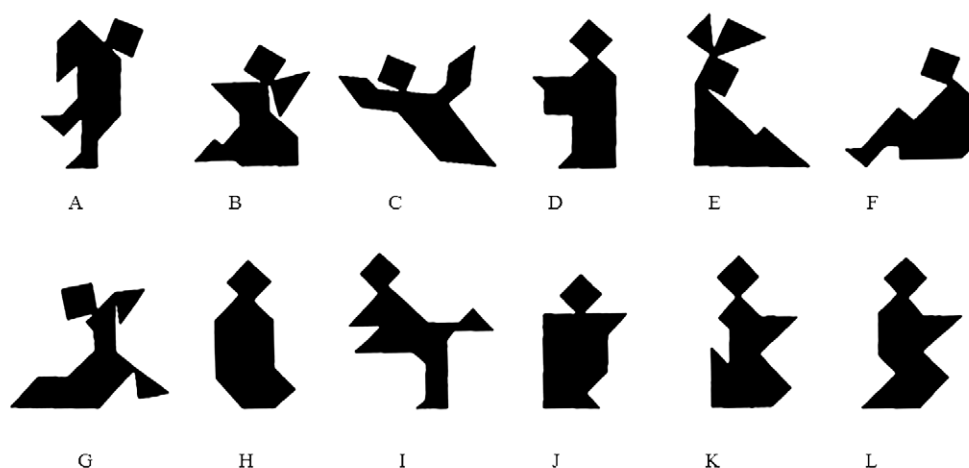


Рис. 1. Стимульный материал эксперимента из работы Clark & Wilkes-Gibbs 1986.

Согласно традиционной теории минимальных усилий, идущей от работ Дж. Ципфа, говорящий пытается произнести минимальную по длине стандартную номинацию (то есть имя собственное, определенную дескрипцию или местоимение), достаточную для того, чтобы адресат смог правильно восстановить

референта. В Clark & Wilkes-Gibbs 1986 авторы предлагают принцип минимальных **совместных** усилий, согласно которому И. и Р. пытаются минимизировать совместные усилия, необходимые для решения поставленной перед ними когнитивной задачи. В отличие от предсказаний традиционной теории данный принцип предсказывает, что (i) И. будет использовать не только стандартные номинации; (ii) эти номинации не всегда будут подходящими; (iii) Р. также будет принимать активное участие в процессе референции.

В работе Clark & Wilkes-Gibbs 1986 этот принцип подтверждается тем, что: (i) И. использует большое количество нестандартных номинаций, число которых, однако, сокращается от 1-й к 6-й попытке; (ii) от 1-й к 6-й попытке сокращается также количество слов, реплик и времени, необходимых И. и Р. для выполнения задания; (iii) И. регулярно меняет первоначальные номинации, особенно в первых попытках; (iv) Р. принимает участие в процессе, предлагая свои варианты наименования танграмм.

С тех пор этот принцип является неотъемлемой частью совместной модели. Однако в по-

следние годы появилось мнение, что он совсем не так бесспорен, как это кажется на первый взгляд, см. Davies 2007. Автор утверждает, что (i) факт использования совместных, а не индивидуальных усилий нельзя верифицировать; (ii) измерение усилий в количестве слов, реплик и затраченного времени не является показательным; (iii) языковая избыточность часто сопровождает подобные когнитивные задачи.

Рассмотрим «за» и «против» на следующих двух примерах из нашего аналогичного исследования, которое было проведено с 36 парами русскоязычных студентов МГУ.

Диалог 1–1:

И: Значит, следующая больше похожа на девушку, почему-то, я не знаю. У неё голова примерно по центру находится. И сзади головы какой-то треугольничек, то ли бантик, то ли ещё что-то такое. И она сидит. Да, и то ли у неё руки, то ли грудь, которая смотрит налево.

Р: Которая смотрит налево, треугольная такая.

И: Да, да.

Р: А голова квадратная?

И: Голова квадратная, да. Ромбиком стоит.

Р: Ещё назад, ещё назад такое какое-то...

И: Ну вот треугольник назад, да, как бантик.

Р: Это есть такое, как платье или не платье.

И: Да. Оно платье.

Диалог 1–2:

И: Значит, следующая это девушка, у которой вниз треугольничек и вот эта грудь и руки налево.

Р: Так, подожди это...

И: Она сидит на попе. У неё платье такое вниз. У неё руки или грудь – налево.

Р: И бантик сзади.

И: Да, один треугольничек сзади.

Диалог 1–3: Потом – эта девушка с грудью налево.

Диалог 1–4: Потом девушка с грудью.

Диалог 2–1: Следующая похожа на квадратного зайца с треугольными ушами, как будто он едет с горки.

Диалог 2–2: Следующая – это квадратный заяц с треугольными ушами съезжает с горки.

Диалог 2–3: Пятая – квадратный заяц с треугольными ушами. Скатывается с горки. Вот.

Диалог 2–4: Третья – это квадратный заяц с треугольными ушами, который с горки скатывается.

Четыре попытки диалога 1 подтверждают идею Кларка – в них очень показательно, от попытки к попытке, уменьшается общее количество слов, уменьшается роль Р, сокращается сама номинация. Однако пример 2 демонстрирует обратное – роль Р сведена к нулю, номинация сохраняет свою избыточность. Собранный корпус имеет большое количество примеров обоего типа.

С другой стороны, оценим **устойчивость** номинации в собранных диалогах, то есть сохранение во второй попытке номинации, данной в первой. Оказывается, что И. менял свою номинацию в 17% случаев, из которых в 36% случаев он делал это по собственной инициативе, в 25% использовал как свою собственную номинацию, так и помощь Р, а в 39% использовал номинацию, придуманную Р. Как представляется, процент изменения первоначальной номинации является слишком небольшим, чтобы можно было говорить о подтверждении принципа минимальных совместных усилий в той формулировке, которая была предложена Кларком. Более правдоподобной, на наш взгляд, является гипотеза об индивидуальном характере усилий, необходимых для выполнения некоторой совместной когнитивной задачи. Такая гипотеза, по нашему мнению, тем не менее не противоречит основной идее совместной модели Кларка.

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ГЕНДЕРНЫЕ РАЗЛИЧИЯ РАННЕГО АНАЛИЗА ПРОСТРАНСТВЕННО ПРЕОБРАЗОВАННЫХ ИЗОБРАЖЕНИЙ

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Из литературы и из обывденной жизни хорошо известно преимущество мужчин в выполнении зрительно-пространственных задач (Моё 2009), в то время как женщины опережают мужчин

в выполнении различных вербальных тестов (Gur et al. 2000). Нейробиологическую основу гендерных различий в выполнении зрительно-пространственных задач большинство авторов связывает с особенностями поздних когнитивных этапов переработки информации, и лишь в единичных исследованиях обсуждается роль ранних стадий переработки в формировании гендерной специфики этой функции. В нашей предыдущей работе (Михайлова и др. 2011), в

задаче наблюдения целых и разгруппированных на элементы разной сложности фигур показано, что у мужчин такое преобразование вызывает достоверные изменения ранней позитивности P1 в затылочных и теменных областях коры, то есть в зрительной системе мужчин изменение структуры объекта детектируется уже на стадии раннего анализа. Настоящая работа продолжает эту линию исследований и направлена на анализ особенностей выполнения мужчинами и женщинами задачи опознания трансформированных изображений, включающей процедуру ментального вращения. Испытуемым (16 женщин и 15 мужчин) предлагали опознать 16 фигур (рисунки животных и техники), которые были целыми или разным образом трансформированными. Трансформация заключалась в программном смещении внутренних деталей в радиальном направлении (1), смещении в сочетании с поворотом деталей на $\pm 0-45$ град. (2) или на $\pm 45-90$ град. (3) относительно их центра тяжести. Целые и трансформированные изображения в случайном порядке предъявляли на экране монитора. В каждой серии предъявляли изображения четырех объектов (ограничение – число кнопок на специальной клавиатуре программы E-Prime.2), которые были целыми или трансформированными. Всего таких серий было три. Испытуемый должен был опознать изображение и нажать кнопку на клавиатуре. Регистрировали точность опознания, время двигательной реакции (ВР) и вызванные потенциалы (ВП) в теменной, височной и затылочной областях зрительной коры. Показано, что выполнение задачи не зависело достоверно от пола: в обеих группах трансформация изображения приводила к ухудшению опознания, максимально при наибольшем повороте деталей. Женщины отличались меньшими значениями ВР, у мужчин наблюдали эффект тренировки: поведенческие показатели опознания улучшались во второй половине опыта относительно первой. Анализ вызванной активности выявил гендерные различия показателей ВП. Только в группе мужчин поворот деталей вызывал в ВП теменных областей достоверное увеличение P1 пропорционально углу поворота деталей. Наибольший прирост P1 наблюдали между 3-м и 4-м уровнями трансформации, то есть при увеличении угла поворота. Важность ранней оценки пространственных характеристик разрозненных фрагментов фигуры для правильной идентификации трансформированных изображений подтверждается снижением амплитуды волны P1 при ошибочных ответах. Достоверную зависимость амплитуды P1 от угла поворота деталей мы наблюдали только

в теменных областях коры, что соответствует данным литературы о ее важной роли в оценке конфигурационных изменений объекта. В литературе описаны изменения ВП этой области коры при операциях мысленного вращения (Yu et al. 2009).

У женщин в ВП зрительной коры не выявлено этапа, чувствительного к повороту деталей. Трансформация фигуры вызывает изменения во временном окне негативности N150, которые связаны со смещением деталей в радиальном направлении и локализованы в других зрительных зонах – затылочной и височной. Известно, что волна N1, как и P1, рассматривается как индекс направленного, или селективного внимания, и ее увеличение естественно связать с повышением уровня внимания при нарушении внешнего контура и появлением в поле зрения не одной, а нескольких фигур. Вместе с тем, в негативности N1 отражаются процессы ранней сенсорной дискриминации зрительных объектов (Vogel and Luck 2000). Можно предположить, что у женщин в период развития волны N1 происходит раннее детектирование изменений формы объекта относительно хранящегося в памяти эталона. То есть, у женщин процессы раннего обнаружения нарушений структуры объекта имеют отличные от мужчин временные и топографические характеристики. При этом детектируются собственно изменения структуры, но не их измеряемые (угол поворота) показатели. Отсутствие значимых поведенческих различий, но заметные различия в вызванной активности позволяет предположить наличие двух стратегий или подходов к решению зрительно-пространственных задач мужчинами и женщинами, на что указывают также данные метаболического картирования, представленные в работах некоторых авторов (Hugdahl et al. 2006). Можно думать, что различия в организации раннего этапа оценки пространственной структуры объекта лежат в основе «координатного» подхода у мужчин, при котором используется метрическая система координат и «категориального» подхода у женщин, основанного на выделении определенных признаков, или меток, в окружающем пространстве (Kosslyn 1987).

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ВЛИЯНИЕ КОГНИТИВНЫХ ФУНКЦИЙ НА ПОДГОТОВКУ ЗРИТЕЛЬНО-ВЫЗВАННОЙ САККАДЫ У ЧЕЛОВЕКА

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Одним из перспективных подходов в исследовании когнитивных функций человека является изучение нейрофизиологических механизмов программирования саккадических движений глаз. Нарушение саккадических движений глаз является маркером многих психических заболеваний, сопровождающихся различными когнитивными расстройствами. В современной психофизиологии разработано большое количество экспериментальных парадигм, дающих возможность оценить вклад отдельных когнитивных функций в программирование саккады и выявить нейрофизиологическую природу этих процессов. Малоизученным остается вопрос о механизмах принятия решения и его взаимосвязи с процессами внимания при программировании саккады. Эта проблема может быть исследована с использованием экспериментальной схемы «двойной шаг» (double step), в которой предъявляется два коротких зрительных стимула (Becker, Jurgens, 1979). Предполагают, что характер ответа в этой парадигме (две саккады или только одна саккада на второй стимул) зависит от завершенности стадии принятия решения о саккаде на первый стимул к моменту предъявления второго стимула.

Механизмы программирования саккадических движений глаз и процессов зрительного восприятия находят отражение в параметрах и топографии усредненных потенциалов ЭЭГ головного мозга человека (Jagla et al., 1994; Славущая и др. 2008).

Цель работы – изучить величину латентного периода (ЛП) саккады, параметры и топографию усредненных потенциалов ЭЭГ, связанных с включением целевых стимулов и подготовкой саккады, в экспериментальной схеме «двойной

шаг», в зависимости от характера саккадического ответа (две или одна саккада) и длительности первого стимула.

У 15 здоровых испытуемых регистрировали ЭЭГ с 24 отведений по системе 10–20; движения глаз регистрировали с помощью ЭОГ. Потенциалы ЭЭГ выделяли с помощью прямого и обратного методов выборочного усреднения перед саккадами со средней величиной ЛП ($M \pm 20$ мс). Последовательные зрительные стимулы появлялись на экране монитора в противоположных полуполях в случайном порядке с вероятностью 50% (pulse-overshoot double step) (Becker W., Jurgens R, 1979). Каждому испытуемому предъявлялось от 1000 до 1500 стимулов в течение двух экспериментов. Изучали величину ЛП саккады на зрительные стимулы, параметры и топографию вызванных и пресаккадических потенциалов ЭЭГ.

Анализ полученных данных показал, что при длительности первого стимула 50 мс наблюдалось увеличение ЛП саккады на первый стимул и числа одиночных саккад на второй стимул по сравнению с длительностью первого стимула 150 мс (на 68 ± 8 мс и на 26%, соответственно, $p < 0.05$). Эти факты могут отражать тормозное влияние сдвига непроизвольного автоматического внимания ко второму стимулу на ранней стадии сенсорной переработки первого стимула, что приводит к затруднению процессов зрительного восприятия и принятия решения.

Показана зависимость выраженности и топографии компонентов ВП на включение первого стимула и пресаккадических потенциалов ЭЭГ в период ожидания зрительной стимуляции от паттерна саккадического ответа. Наблюдалось уменьшение латентности пиков компонентов P100 и N150 ВП при ответе в виде двух саккад по сравнению с ответом в виде одиночной саккады на второй стимул ($p < 0.05$), что может свидетельствовать об ускорении начального этапа программирования первой саккады, связанного с процессами внимания и принятия

решения (Fischer, 1987). Временные параметры компонента P100 и локализация его фокусов в латеральных и медиальных зонах лобной коры позволяет предположить, что он может служить ЭЭГ-коррелятом процесса принятия решения. Доминирование фокусов потенциала N 150 в лобных и теменных зонах контралатерального относительно первого стимула полушария может отражать включение лобно-теменной сети пространственного внимания в процессы сенсорной переработки первого стимула и выбора саккадической цели.

При ответе в виде одной саккады на второй стимул показана более частая локализация фокусов потенциала N 150 в лобно-центральных зонах, по сравнению с ответом в виде двух саккад ($p < 0.05$). Подобная топография потенциала может отражать включение нисходящих (top-down) механизмов внимания, которые влияют на «оценку» первого стимула при выборе саккадической цели и принятие решения в пользу второго стимула, а также непосредственную взаимосвязь процессов внимания и принятия решения при программировании саккады (Miller, Cohen, 2002).

Анализ медленных негативных потенциалов ПМН1 и ПМН2 (аналогов компонентов волны CNV) в предстимульном периоде выявил влияние процессов ожидания и моторной готовности на характер саккадического ответа в парадигме «двойной шаг». Полученные данные свидетельствуют о более раннем включении когнитивных процессов внимания и прогнозирования на этапе ожидания стимульной реализации при ответе в виде одной саккады на второй стимул. При

этом показана преимущественная локализация фокусов компонента ПМН2 в контралатеральном относительно направления саккады полушарии. Этот факт дает основание предполагать включение процессов моторного внимания и прогнозирования в подготовку саккады в экспериментальной схеме «двойной шаг».

Топография компонентов ВП и медленных негативных потенциалов ЭЭГ при ожидании стимулов, с включением медиальных лобно-центральных и теменных зон, может отражать активацию фронто-медио-таламической и таламо-париетальной модулирующих систем избирательного внимания на различных стадиях подготовки саккадических движений глаз.

Полученные данные показали, что паттерны саккадического ответа в экспериментальной схеме «двойной шаг» зависят не только от степени завершенности стадии принятия решения о первой саккаде к моменту предъявления второго стимула, но и от процессов скрытого внимания в период ожидания стимула, направление которого может определять характер ответа независимо от расположения первого стимула.

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КОГНИТИВНЫЕ СТРУКТУРЫ И ЗВУКОСМЫСЛОВЫЕ СВЯЗИ В ПОЭТИЧЕСКОМ ТЕКСТЕ

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Стихотворение Б. Пастернака «Дурной сон» (1914) представляет пример оперирования когнитивными структурами (т. е. структурами, заложенными в значения языковых выражений), которое стимулируется звуко-смысловой энергией пастернаковского стиха. В этом стихотворении, написанном под впечатлением первых месяцев войны, используется ассоциация с народным поверьем: увидеть во сне, как

выпадают зубы, означает смерть. У Пастернака этот сон приснился «небесному постнику»; это необычный, навязчивый сон, его неотвязность подчеркнута рядом слов с согласными С-Н: *проснуться, сон* и одновременно с парой *засунутый – засов*:

... не может *проснуться*,
Не может, *засунутый* в сон на засов.

За упоминанием приметы к ключевому слову «зубы» присоединяются образующие тематический куст всё новые и новые однокоренные слова, которые должны отразить счет

МОЗГОВОЕ ОБЕСПЕЧЕНИЕ НОВОГО ПОВЕДЕНИЯ И МОДИФИКАЦИЯ ПРОШЛОГО ОПЫТА

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Стабильное выполнение нового поведения, внешне выглядящее как повторение, сопровождается повышением его устойчивости к интерференции (Wixted, 2004) и обеспечивается меняющейся активностью мозга (Kelly, Garavan, 2005). Эти феномены интересны тем, что формирование памяти продолжается после обучения и может быть нарушено. Например, если ученик начал успешно решать задачи, мы обычно говорим, что он «научился», хотя соответствующая память еще не консолидирована.

Динамика мозговой активности, связываемая с консолидацией памяти (её переходом в стабильную форму), описывается как постепенное снижение роли гиппокампа одновременно с повышением роли корковых областей мозга (см. Dudai, 2004). Также подобная динамика показана для передней и задней областей цингулярной коры (Freeman, Gabriel, 1999). Однако ряд авторов связывает эту динамику не только с формированием нового, но и с модификацией прошлого опыта, на основе которого формировался новый опыт (Александров, 2005; McKenzie, Eichenbaum, 2011). Поэтому для исследования динамики мозгового обеспечения поведения необходимо не только выявлять связь активности мозга с поведением, но и идентифицировать специфическую связь регистрируемых показателей с *новым* опытом. Это возможно при регистрации активности и определения специализации одиночных нейронов в ходе выполнения поведения.

Цель настоящей работы – сопоставить показатели динамики мозгового обеспечения поведения, связанные с формированием нового и модификацией ранее сформированного опыта.

Животных поэтапно обучали получать порции пищи с помощью нажатия на педаль с одной и другой стороны симметричной экспериментальной камеры. Проводили регистрацию активности нейронов передней (AP –4 мм, ML \pm 1–2 мм, глубина погружения более 2 мм) и задней (AP +9–10 мм, ML \pm 1–2 мм; Freeman, Gabriel, 1999; Vogt et al., 1986) областей цингулярной коры мозга кроликов стеклянными электродами (KCl 3,0 М; 2–6 МОм на частоте 1кГц) после обучения. Ранними стадиями научения считали первые пять дней после обучения нажатия на

обе педали, поздними – последующие дни эксперимента. У каждого животного регистрацию активности нейронов проводили на ранних стадиях научения в одной области коры, а на поздних – в другой. Последовательность областей регистрации была сбалансирована.

Для всех зарегистрированных клеток вычисляли среднюю частоту потенциалов действия («спайков») за весь период регистрации. Каждый нейрон классифицировали в соответствии с его специализацией относительно отдельных поведенческих актов, отражающей принадлежность нейрона к функциональной системе поведенческого акта (Швырков, 2006). Среди них выделяли нейроны «новых систем», обеспечивающие выполнение поведения, сформированного при обучении в экспериментальной камере.

Выявлено, что средняя частота спайков нейронов передней цингулярной коры на ранних стадиях научения выше, чем в задней, а на поздних стадиях, наоборот, ниже, чем в задней (дисперсионный анализ, основной фактор стадии научения $F(1) = 17,24$; $p < 0,001$; взаимодействие стадии и области коры $F(2) = 5,33$; $p < 0,01$). Эти данные, полученные при регистрации активности одиночных нейронов, соответствуют результатам анализа мультиклеточной активности нейронов передней и задней цингулярной коры (Freeman, Gabriel, 1999), а также данным картирования активности этих зон (например, Trasy et al., 2003). В то же время от ранних к поздним стадиям научения доля нейронов, специализированных относительно актов нового поведения, не меняется ни в передней, ни в задней цингулярной коре (критерий χ^2 ; $p > 0,4$; см. также Созинов и др., 2010). Следовательно, динамика, описываемая в литературе как консолидация новой памяти, не связана с изменением числа нейронов, обеспечивающих новое поведение. Возможно, что изменение показателей суммарной активности нейронов отражает процессы модификации опыта, лежащего в основе формирования нового, – реконсолидационные процессы (см. «аккомодационная реконсолидация» в Alexandrov et al., 2001; а также McKenzie, Eichenbaum, 2011).

Таким образом, для оценки динамики мозгового обеспечения нового поведения необходимо идентифицировать показатели активности, специфически связанные с реализацией нового опыта. По-видимому, многие данные литературы описывают динамику мозгового обеспечения поведения, не разделяя процессы консолидации

новой памяти и аккомодационной реконсолидации. Полученные нами данные соответствуют представлению о научении как эволюционном процессе, предполагающем отбор нейронов в новую систему при научении (Александров, Сварник, 2009), необратимость специализации нейрона и модификацию прошлого опыта при формировании нового.

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О САМООРГАНИЗУЮЩЕЙСЯ КОГНИТИВНОЙ АРХИТЕКТУРЕ

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Можно уверенно сказать, что развитие когнитивной науки является одним из важнейших направлений деятельности человека как в познании себя, так и окружающего мира. Одной из актуальных на сегодняшний день проблем когнитивной науки является построение такой когнитивной архитектуры, которая позволила бы приблизиться хотя бы в некоторой мере к моделированию процессов мышления человека.

Данный доклад посвящен проблемам моделирования когнитивных процессов человека в вычислительной среде. В течение десятилетий развития когнитивной науки и систем искусственного интеллекта появились десятки различных вариантов когнитивных архитектур. Когнитивная архитектура – это, по сути, модель того, как происходит процесс познания человека. Каждая из них отражает определенный результат целенаправленных исследований в областях когнитологии, систем искусственного интеллекта, нейронауки, синергетики и других смежных областях. Каждая содержит определенный набор признаков и критериев, которые возможно выделить. Они были выделены группой ученых под руководством Алексея Самсоновича (<http://bicasociety.org/cogarch/architectures.htm>). Наиболее известными, из рассмотренных

когнитивных архитектур, являются: ACT-R, Soar, GMU-BICA.

Внешне, ACT-R похож на язык программирования, однако его конструкция отражает процесс познания человека. Этот механизм реализован за счет множества фактов, полученных из психологических экспериментов. Одним из наиболее важных качеств ACT-R, которое выделяет его среди других исследовательских проектов этой области, является то, что он позволяет собирать количественную информацию и делать сравнение с человеческими показателями.

Главной целью проекта Soar является возможность оперирования большим количеством интеллектуальных агентов. Области применения Soar начинаются от примитивных, рутинных операций до решения сложнейших задач. Чтобы это реализовать, по мнению разработчиков Soar, он должен иметь возможность создавать представления и использовать соответствующие формы знания (например, процедурные, декларативные, эпизодические).

Проект GMU-BICA также является когнитивной архитектурой, которая позволяет воссоздать в вычислительной среде ряд качеств человеческого познания, включая базовые системы памяти (рабочая, семантическая, эпизодическая, процедурная), возможность развития когнитивных способностей, социальные, эмоциональные и коммуникативные возможности, основы самосознания. Эти функции реализуются в системе, не за счет реализации в каждом агенте, а в

идеализированной абстракции, которую представляют все агенты в целом.

При более детальном рассмотрении признаков и критериев можно заметить, что практически у всех представленных когнитивных архитектур выделенные критерии остаются статическими. То есть на протяжении времени набор признаков практически у всех систем остается неизменным. Изменения касаются лишь отдельно взятых компонентов системы; структура всей системы в целом остается инвариантной.

Например, основные компоненты, связанные с памятью, представлены наличием: рабочей, семантической, эпизодической, процедурной памяти. Существует определенный класс задач, который требует всех четырех типов памяти в когнитивной архитектуре. Однако в большинстве случаев системе необходимы всего два или даже один из представленных выше компонентов для решения конкретных задач.

Динамический подход к построению когнитивной архитектуры позволяет из заранее сформированных компонентов, исходя из специфики задачи, сформировать наиболее эффективную систему, которая была бы адаптирована для конкретной задачи.

Термин «самоорганизующаяся система» был введен У.Р. Эшби в 1947 г. Долгое время практиковались различные интерпретации понятия самоорганизации системы, отражающие общее представление способности системы улучшать свою организацию. В настоящий момент понятие «организованность» системы эффективно определяется через энтропию, а понятие самоорганизации трактуется как способность системы к стабилизации некоторых параметров посредством направленной упорядоченности ее структурных и функциональных отношений с целью противостояния энтропийным факторам среды.

Алгоритмы, реализующие решения задачи, делятся на: обучающие, адаптивные и самоорганизующиеся. Легко установить связь между различными уровнями и соответственно алгоритмами. Так, в любом адаптивном алгоритме можно выделить два этапа:

- накопление информации с целью устранения информативной неопределенности

- решение задачи в условиях полной определенности.

Поскольку решение задачи на втором этапе относится к уровню обучения, то это означает, что адаптивный алгоритм включает в себя обучающийся. В условиях принципиально неустраняемой информативной неопределенности (уровень самоорганизации) не разработано иных подходов, кроме постоянного слежения за внешней средой, прерываемого этапами адаптации. Во время последних с целью получения удовлетворительного решения полагают информативную неопределенность устранить и решают задачу на уровне адаптации или обучения. Отсюда видна связь уровней самоорганизации и адаптации, аналогичная связи адаптации и обучения. Наличие отмеченной связи между алгоритмами приводит к тому, что адаптивные и самоорганизующиеся алгоритмы часто называют обучающимися. Этому способствует и то, что существуют алгоритмы более высокого уровня, успешно решающие задачу, находящуюся уровнем ниже. Подобное отношение можно заметить между:

- самонастраивающимися алгоритмами и самообучающимися,
- адаптивными и обучающимися,
- самоорганизующимися и адаптивными.

Но самое существенное заключается в том, что обратное соотношение между алгоритмами разного уровня никогда не имеет места. Именно поэтому для создания систем, успешно решающих те же интеллектуальные задачи, что и человек, необходимо развитие методов самоорганизации. Таким образом, самоорганизация, применительно к когнитивной архитектуре, должна позволять получить архитектуру, способную к изменению своей структуры, с целью не только увеличения своей эффективности для решения поставленных задач, но и воссоздания подобия процессов мышления человека. В докладе будут проанализированы наиболее развитые современные когнитивные архитектуры, существующие в виде программных комплексов, и будет предложен и рассмотрен новый подход к построению самоорганизующейся когнитивной архитектуры.

ПРОСТРАНСТВЕННАЯ СИНХРОНИЗАЦИЯ БИОПОТЕНЦИАЛОВ МОЗГА В ПРОЦЕССЕ ЧТЕНИЯ НА РУССКОМ ЯЗЫКЕ СТУДЕНТАМИ-НИГЕРИЙЦАМИ

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В современных условиях развития России как промышленного и культурного партнера в мировом сообществе актуализируется проблема изучения русского языка. Трудности овладения русским языком иностранными студентами связывают с различными факторами, в том числе и с особенностями родной речи обучающихся [Полякова 2007: 37–40]. Известно, что физиологической основой речевой деятельности человека является совокупность функциональных систем, формирующихся в процессе овладения языком. Показано, что специфика физиологического механизма, организующего определенный вид речевой деятельности, зависит от системы взаимосвязанных звеньев, различных по природе, структуре и «глубинности». В зависимости от задач, стоящих перед организмом, эти механизмы будут различаться. [Анохин 1972, Бернштейн 1990]. Изучение показателей биоэлектрической активности головного мозга при речевой деятельности позволяет приблизиться к пониманию обеспечивающих ее психофизиологических механизмов [Вольф и др. 2004: 27–34, Воробьев и др. 2000: 5–12, Леонтьев 1970].

Цель исследования: выявить особенности пространственной синхронизации биопотенциалов мозга в процессе чтения текста на русском языке студентами-нигерийцами.

В исследовании принимали участие 12 студентов-нигерийцев в возрасте от 19 до 22 лет. Все обследованные прошли подготовительный курс по изучению русского языка. Государственным языком нигерийцев является английский, русский язык в данном исследовании выступал в качестве иностранного языка. Электроэнцефалограмма (ЭЭГ) регистрировалась монополярно с объединенным ушным электродом от симметричных отведений левого и правого полушарий. Локализация отведений определялась по международной системе «10–20». ЭЭГ регистрировали непрерывно во время чтения на английском и русском языке. Исходным материалом для анализа служили безартефактные отрезки ЭЭГ длительностью 1 минута 10 секунд. Основным анализируемым параметром пространственно-временной

организации электрической активности мозга был максимум оценки функции когерентности (КОГ) ритмических составляющих биопотенциалов в диапазонах частот: альфа – 8–13 Hz; бета – 13–30 Hz; тета – 4–8 Hz. Рост КОГ для пары отведений рассматривался как показатель усиления функционального взаимодействия (внутри- и межполушарного) между соответствующими областями коры. Статистический анализ результатов проводили с применением компьютерных программ SPSS 14,0 для Windows. Оценка достоверности различий проводилась с использованием непараметрического метода критерия Вилкоксона. При анализе полученных результатов учитывались только достоверные изменения функций КОГ ($p \leq 0,05$).

При переходе от состояния спокойного бодрствования к чтению текста на русском языке у обследованных в диапазонах альфа- и бета-колебаний обнаружен значимый рост КОГ в затылочных и теменных межполушарных отведениях. Билатеральное вовлечение в процесс чтения теменных и затылочных отделов коры является следствием поддержания зрительного внимания, направленного на анализ поступающей зрительной информации [Бетелева 1983, Мачинская и др. 1992: 77]. Увеличение функционального взаимодействия наблюдалось и в области тета-диапазона, отмеченное в зонах левой гемисферы: лобной и теменной, теменной и затылочной, передневисочной и затылочной. Сравнительный анализ показателей БЭА мозга студентов-нигерийцев при чтении текста на русском и английском (родном) языке выявил значимое увеличение функции КОГ в альфа-диапазоне в заднеассоциативной области левого полушария: передневисочной и височно-теменно-затылочной, теменной и затылочной, передневисочной и теменной, передневисочной и затылочной.

Таким образом, результаты исследования выявили в процессе чтения студентами-нигерийцами на иностранном (русском) языке реорганизацию пространственного взаимодействия зон коры в основном левого полушария. По всей вероятности, чтение текста на иностранном языке вызывает у обследованных активацию нейронных структур, организующих перекодировку слов из зрительной в фонологическую форму в угловой извилине и последующую обработку их фонологических свойств в зоне Вернике

[Воробьев и др. 2000:5–12]. Менее автоматизированный навык чтения на русском языке (по сравнению с родным) обусловлен сложностью звуко-буквенного анализа, дифференцировкой слов, близких по звучанию, или интеграцией их в более крупные речевые единицы. Все это вызывает дополнительное напряжение в структурных звеньях формирующейся функциональной системы. Семантический анализ «новых» слов, поддержание внимания и регуляция целенаправленной деятельности во время чтения на иностранном языке требует активного вовлечения лобных структур [George et al. 1999: 1317–1325.]. О большем эмоциональном напряжении свидетельствует увеличение вклада частот тета-диапазона, которое также может быть обусловлено и активацией механизмов эпизодической памяти [Вольф и др. 2004: 27–34, Шульгина 2005: 59–71].

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РЕОРГАНИЗАЦИЯ БИОЭЛЕКТРИЧЕСКОЙ АКТИВНОСТИ МОЗГА СТУДЕНТОВ В ПРОЦЕССЕ ЧТЕНИЯ ТЕКСТОВ НА РУССКОМ И АНГЛИЙСКОМ ЯЗЫКАХ

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Важнейшей характеристикой нейрофизиологических механизмов, опосредующих деятельность, является характер внутри- и межполушарных интеграций. Изменение синхронности электрической активности в мозговых структурах может отражать не только особенности функциональных систем, реализующих тот или иной вид когнитивной деятельности, но и возможность применения различных стратегий при решении однотипных задач (Николаев и др. 2000, Структурно-функциональная организация развивающегося мозга, 1990). В современных условиях социально-экономического и культурного развития нашей страны высокий уровень владения иностранным языком приобретает все большее значение. Актуальным на сегодняшний день является выявление функционального обеспечения процесса чтения не только на русском, но и на иностранном языке.

Цель работы – выявление особенностей реорганизации биоэлектрической активности головного мозга в процессе чтения на русском и

английском языках. Обследовано на добровольной основе 34 русских студента неязыковых факультетов университета в возрасте 20–22 лет. Регистрация электроэнцефалограммы (ЭЭГ) производилась в состоянии спокойного бодрствования при закрытых глазах и при чтении текста про себя. Для чтения предлагались отрывки художественных текстов на русском и на английском языке. Главным условием чтения являлась не скорость, а понимание текста. Регистрацию ЭЭГ осуществляли стандартными методами. Локализация отведений определялась по международной системе «10–20», а (ТРО) по методу Т. Г. Бетелевой (1983). Для анализа отбирались свободные от артефактов фрагменты ЭЭГ длительностью 70 с. Основным анализируемым параметром был максимум оценки функции когерентности (КОГ) ритмических составляющих биоэлектрической активности мозга (БЭА) в диапазонах частот: альфа – 8–13 Гц, бета – 14–35 Гц, тета – 4–7 Гц. Оценка достоверности различий проводилась с использованием параметрического t-критерия Стьюдента. Различия считались статистически значимыми при величине вероятности ошибочного принятия нулевой гипотезы о равенстве

генеральных средних $p < 0,05$. Когерентный анализ БЭА мозга при переходе от фона к чтению на *русском* языке обнаружил увеличение межполушарных диагональных связей между дистантно удаленными отведениями в диапазоне бета-колебаний: между затылочными и центральными областями обоих полушарий, а также правой затылочной и левой лобной зонами. Именно активация этих областей мозга отражает обработку поступающей информации: от восприятия и узнавания слова до установления синтагматическо-семантических связей, поэтических ассоциаций (Лурия 1975). Усиление синхронизации биоэлектрических потенциалов лобных отделов обоих полушарий с другими отделами коры говорит об обязательном участии лобных долей в осуществлении процессов формирования и восприятия речи (Иваницкий и др. 2002: 5–11, Цицерошин и др. 2000: 20–30, Шеповальников и др. 2004: 411–422). Усиление функционального взаимодействия наблюдалось и в полосе частот тета-диапазона. В обработку текста активно включались отделы правого полушария, преимущественно зона *ТРО*, височная и затылочная области, образующие многочисленные связи с зонами левой гемисферы. Показано, что физиологические механизмы правой гемисферы ответственны за формирование глубинно-семантического уровня высказывания, за различение интонационных, особенно эмоциональных контуров (Траченко 2001: 29–35, Шульгина 2005: 59–71). Исследование показателей БЭА мозга в процессе чтения на *английском* языке по сравнению с фоном показало значимый рост КОГ в альфа-диапазоне между зонами *ТРО* обоих полушарий, который также наблюдался в бета- и тета-диапазонах. Большую реактивность бета-диапазона при чтении иностранного текста подтверждает увеличение дистантных диагональных связей и общее количество областей, образующих функциональное взаимодействие: правой затылочной области с зоной *ТРО*, височной и центральной зонами левого полушария, и левой затылочной с фронтальной, центральной и височной зонами правого полушария. По всей вероятности, обработка текста на иностранном языке требует не только функционального объединения «речевых» областей мозга обоих полушарий, но и создание локальных систем, работающих на определенных частотах. При сравнении КОГ биоэлектрических потенциалов мозга в процессе чтения на *английском* и *русском* языке выявили усиление пространственной синхронизации височной и затылочной зон правого полушария практически со всеми областями левого полушария в диапазоне бета-колебаний.

Видимо, рост пространственного взаимодействия осуществляется на базе активизации словообразовательной деятельности, в которой специфическую роль играет правая гемисфера (скорее всего на уровне образов слов). Исследованиями О.П. Траченко и др. (2001) показано, что правое полушарие ответственно за цельность создаваемых текстов. Таким образом, при оценке динамики функционального взаимодействия зон коры больших полушарий мозга при чтении обнаружена менее экономичная и более генерализованная функциональная организация процесса чтения на *английском* языке по сравнению с *русским*. Системные перестройки реализации процесса чтения на *английском* языке характеризуются активацией заднеассоциативных областей мозга на всех анализируемых частотных диапазонах. Следует отметить и активацию межполушарных связей, что свидетельствует о необходимости тесного взаимодействия областей разноименных полушарий мозга, участвующих в обработке текста.

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ДРОБЛЕНИЕ СРЕДЫ МОЛОДЫМИ ИНДИВИДАМИ ПО ПОКАЗАТЕЛЯМ НЕЙРОНАЛЬНОЙ АКТИВНОСТИ

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Способность к научению во время полового созревания привлекает меньше внимания по сравнению с широко обсуждаемой проблемой ухудшения познавательных способностей в старости. Изменения, которые происходят во время старения (например, снижение детализации воспоминаний, восприятие разных мест как одного и того же и пр.), находят свое отражение в активности мозга (Wilson et al. 2006). У взрослых животных активность одной из структур мозга – ретроспленальной области коры – специфически связана с обеспечением сложного инструментального поведения (Александров и др. 1997); известно, что у людей активность этой структуры связана с обеспечением форм поведения, которые появляются или получают наибольшее развитие на поздних стадиях индивидуального развития (в частности, материнское поведение (Bartels and Zeki 2004), формирование модели психического (Saxe and Powell 2006) и социальный интеллект (Adolphs 2001)). На основе этих данных нами было высказано предположение, что ретроспленальная кора будет специфически вовлекаться в формирование сложного инструментального поведения у взрослых, что соответствует высокодифференцированному соотношению со средой. А у молодых индивидов соотношение со средой будет менее дифференцированным, что отразится в отсутствии или меньшем числе специализированных нейронов.

Целью исследования было сравнение характеристик импульсной активности нейронов ретроспленальной коры, зарегистрированных у молодых животных во время реализации ими инструментального пищедобывательного поведения, с данными, полученными ранее на взрослых животных.

У предварительно поэтапно обученных инструментальному пищедобывательному поведению молодых крыс (1,5–2 месяца во время начала обучения, $n=4$) Лонг-Эванс была зарегистрирована импульсная активность нейронов ретроспленальной области коры во время проведения двух исследований в клетках, оснащенных двумя педалями и двумя кормушками по углам. В первом, хроническом, опыте

импульсную активность нейронов регистрировали тетрадами (счетверенными платино-иридиевыми проволочками) в процессе обучения животных циклическому пищедобывательному поведению на второй в истории обучения стороне установки и во время реализации дефинитивного поведения на обеих сторонах. Во втором, остром, опыте активность нейронов записывали с помощью одиночных стеклянных или вольфрамовых микроэлектродов только во время сессий дефинитивного поведения.

Среди 39 нейронов (25 в остром опыте и 14 – в хроническом), зарегистрированных в дефинитивном поведении на двух сторонах, было только 3 нейрона, зарегистрированных в остром эксперименте и специализированных относительно актов пищедобывательного поведения. Большая часть зарегистрированных нами нейронов ретроспленальной коры были отнесены к нейронам с неустановленной специализацией, у некоторых из них частота разрядов модулировалась пищедобывательным поведением. У взрослых животных (Svarnik et al. 2005) в условиях острого эксперимента стеклянными микроэлектродами было зарегистрировано значимо больше нейронов (точный критерий Фишера $\chi^2=5,93$, $df=1$, $p=0,01$), специализированных относительно актов пищедобывательного поведения, сформированных в экспериментальной клетке («новые» нейроны, 58 из 158), и меньше нейронов с неустановленной специализацией (74 из 158, $\chi^2=10,747$, $df=1$, $p=0,001$).

Ни один из 10 нейронов, зарегистрированных тетрадами у молодых животных в процессе обучения нажатия эффективной педали, не был отнесен к специализированным относительно актов пищедобывательного поведения. У взрослых животных было обнаружено больше «новых» нейронов (13 из 48, $\chi^2=3,68$, $df=1$, $p=0,054$) и статистически значимо меньше нейронов с неустановленной специализацией (33 из 48, $\chi^2=4,454$, $df=1$, $p=0,031$), по сравнению с молодыми.

Использование различных способов экстраклеточной регистрации импульсной активности нейронов ретроспленальной коры позволило продемонстрировать одну и ту же тенденцию: доля специфически связанных с выполнением задания нейронов ретроспленальной коры у молодых индивидов меньше, чем у взрослых. Схожие данные были получены с применением другой методики: было показано, что при антиципации выигрыша задняя цингулярная кора (в

состав которой входит ретроспективная область) активируется у молодых взрослых людей (22–28 лет), но не подростков (12–17 лет) (Bjork et al. 2004).

Таким образом, полученные данные свидетельствуют о различии в мозговом обеспечении дробления среды молодыми и взрослыми индивидами.

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УПРАВЛЕНИЕ ВЫБОРОМ ДЕЙСТВИЙ В КОМПЛЕКСНОЙ СИТУАЦИИ

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На материале выбора тактики ведения врачами-педиатрами исследовалась возможность управления выбором действий в комплексной ситуации. Выбор тактики ведения ребенка интерпретируется как комплексная ситуация в соответствии с общепризнанным пониманием комплексности, сформулированным, например А. Bennet, D. Bennet (2008: 4).

В последипломном образовании врачей возникает задача управления выбором тактики ведения и предсказания выбираемых врачами вариантов, которая обсуждается в теории рефлексивных игр В.А. Лефевра (2009: 7). В практическом плане эта задача определяется необходимостью повышения качества медицинской помощи.

Ранее мы предъявляли испытуемым 3 ситуационные задачи и по 3 варианта решения каждой задачи; предлагалось оценить варианты решения от 0 до 6 по шкалам, отражающим объективно существенные для выбора решения параметры: типичность, соответствие ходу развития ребенка, правильность, реальность (возможность реализации), степень риска отрицательных последствий. Затем предлагалось выбрать вариант, который испытуемый выбрал бы в реальной ситуации (Мозжухина, Ратынская, Солондаев 2011).

Обнаружилась высокая устойчивость групповых оценок. Оценки 50 врачей и 60 студентов

оказались статистически неразличимы, а объективно разные варианты решения получили сходные оценки.

При этом данные региональной медицинской статистики однозначно свидетельствуют, что вероятность выбора правильных вариантов в реальности значительно ниже, чем в исследовании, а вероятность выбора неправильных вариантов существенно выше, что требует проверки гипотезы о некомпетентности испытуемых.

Полученные результаты мы интерпретировали как проявление теоретически описанного В.А. Лефевром (2009: 64) феномена: каждый субъект может иметь свое особое множество действий (в нашем случае – вариантов тактики ведения) с заданным на нем своим особым отношением реализуемости. Тогда полученные оценки отражают не заданные названиями шкал объективные аспекты ситуации, а сложную смесь объективных и субъективных характеристик. Испытуемые «наполняют» объективные шкалы собственным содержанием.

Для проверки этого предположения было проведено исследование на группе из 20 врачей, которым предлагалось сформулировать дополнительный – субъективный критерий оценки решений.

Результаты подтвердили выдвинутую гипотезу, но из-за ограниченного объема мы опишем их только частично. Обработка проводилась в статистическом пакете R (2011) с использованием критериев Хи-квадрат Пирсона и критерия Фишера (Agresti 1990) для обеспечения надежности статистических оценок по А.И. Орлову (2004).

Из всех решений частота выбора неправильных статистически значимо ниже как по критерию Фишера ($p < 0.001$), так и по критерию Хи-квадрат ($X = 20.33$, $p < 0.001$). Но оценки по объективным параметрам независимы от правильности решений. Например, оценка риска независима от правильности вариантов решения (рис. 1а), как по критерию Фишера ($p = 0.29$), так и по критерию Хи-квадрат ($X = 15.32$, $p = 0.22$) что объективно неверно.

Статистически значимое предпочтение верных вариантов решения опровергает гипотезу о некомпетентности испытуемых.

Независимость оценок решений от их правильности может интерпретироваться не как различие содержания одной и той же шкалы у разных субъектов, а как неадекватность шкалы по отношению к оцениваемому варианту решения.

Предположение о неадекватности шкал опровергается результатами анализа сопряженности оценок по шкалам с выбором варианта решения. По всем шкалам выявлены статистически значимые связи, показывающие, что испытуемые выбирают именно те варианты решения, которые оценивают как наиболее оптимальные.

Например, выявляется связь между оценками риска и выбором варианта решения (рисунок 1б). Связь статистически значима по критерию Фишера ($p = 0.02$) и по критерию Хи-квадрат ($X = 15.0044$, $p = 0.02$).

Статистически значимая по критериям Фишера ($p < 0.0001$) и Хи-квадрат ($X = 35.07$, $p < 0.0001$) связь выявилась также между выбором решения с его оценкой по субъективной шкале, что также подтверждает гипотезу о несовпадении интерпретации объективных параметров решений у разных испытуемых.

Полученные результаты позволяют сделать вывод, что возможность управления выбором действий субъекта в комплексной ситуации ограничивается несовпадением множеств действий и отношений реализуемости у разных субъектов.

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ВЛИЯНИЕ СЕМАНТИКИ ЛЕКСИЧЕСКИХ ЕДИНИЦ РОДНОГО ЯЗЫКА НА ИСПОЛЬЗОВАНИЕ ИНОЯЗЫЧНОЙ ЛЕКСИКИ

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Одно из широко распространенных на сегодняшний день представлений о языковой способности приписывает ей универсальный характер (Хомский, 1962), т.е. утверждается, что принципы функционирования языка являются общими для всех его носителей, независимо от особенностей самого языка. Если предположить, что это обобщение в равной степени охватывает не только родной (первый) язык, но и второй, третий и т.д. языки, то эта идея становится проверяемой эмпирически. Наше исследование посвящено одному из возможных направлений такой проверки: влиянию семантики лексических единиц родного языка

на функционирование лексики второго и третьего языков.

Разноплановые знания, в том числе лексика, хранятся в семантической памяти в абстрактной, символической форме и связаны посредством семантических отношений (Норман, 1985; Хофман, 1986). Под семантическими отношениями в данном случае понимаются отношения синонимии, антонимии и др. При извлечении из памяти одного объекта (слова) активизируется целый сегмент связанных между собой узлов семантической сети. Это обстоятельство широко используется в процедурах семантического прайминга, когда происходит повышение скорости вербального ответа или изменение его качества, если целевому стимулу предшествует другой стимул (прайм), связанный с ним семантически. Семантический прайминг действует даже имплицитно, т.е. в ситуации, когда испытуемые уверены, что не видели

прайма (McNamara, 2005). Существование этого феномена открывает возможность сравнения организации лексики нескольких языков, которыми владеет человек, и их возможного взаимного влияния.

Суть использованной нами процедуры состоит в следующем: если при выполнении перевода с одного иностранного языка на другой сублиминальная (неосознаваемая) подсказка на родном языке окажется эффективной, т.е. значительно ускоряющей или замедляющей время правильного перевода, то за счет варьирования праймов, активизирующих разные типы семантических и синтаксических отношений, мы сможем оценить взаимодействие между семантическими сетями родного и двух иностранных языков. По аналогии можно оценить взаимодействие синтаксических структур первого, второго и третьего языков.

Нами была сформулирована гипотеза о том, что семантические отношения лексики родного языка опосредуют использование лексики иностранных языков, т.е. активизация семантических структур родного языка оказывается необходимой для перевода с одного иностранного языка на другой. Для проверки этой гипотезы был проведен эксперимент, в ходе которого испытуемые переводили словосочетания с испанского языка на английский и с английского на испанский, при этом им предъявлялись праймы на русском языке. Продолжительность предъявления подсказки гарантировала ее неосознаваемый характер. Если при предъявлении подсказки время правильного перевода значительно уменьшается, то можно сделать вывод, что семантические сети русского языка первичны по отношению ко всем остальным. Если подсказка замедляет перевод, значит, испытуемым требуется дополнительное время на ее обработку, т.е. активизировавшийся русский язык выступает помехой, что говорит о независимости семантических полей языков.

В эксперименте испытуемых просили перевести короткие словосочетания (наподобие *Bellas flores* – «Красивые цветы») с испанского языка на английский и с английского на испанский как можно быстрее. Словосочетания составлялись только из лексических единиц, встречающихся в текстах экзаменационных заданий на уровень

владения языком B1. Правильность словосочетаний проверялась по корпусам текстов Corpus de español, Corpus de Referencia del Español Actual и British National Corpus. К каждому словосочетанию были подобраны праймы на русском языке следующих видов: прямой перевод, близкий синоним, далекий синоним и антоним, что отражает определенные семантические отношения слова. Например, к стимулу *Aguantar el frío* «Терпеть холод» предлагался один из следующих праймов: *холод, мороз, прохлада, жара*. В качестве контрольного условия использовалось отсутствие подсказки (пустой прайм).

В исследовании приняли участие 5 испытуемых, каждый из которых владеет испанским и английским языками на уровне не ниже B1 согласно CEFR. Родной язык всех испытуемых – русский.

Для проведения эксперимента была использована программа E-Prime 2.0, в которой показывалась презентация слайдов, фиксировалось время ожидания ответа, время произнесения ответа, а также тип подсказки и стимула. На Схеме 1 приводится структура одной пробы.

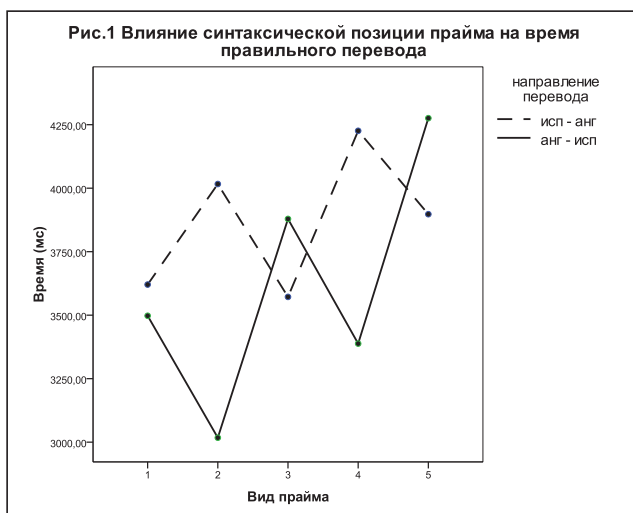
Длительность прайма составляла 12 мс, маски – 12 мс, фиксационного креста – 750 мс, длительность остальных слайдов определялась самим испытуемым.

Статистический анализ данных с помощью критерия Вилкоксона выявил значимое влияние русских праймов на скорость перевода словосочетаний с испанского языка на английский и с английского на испанский, но только в том случае, если прайм являлся синонимом ($p=0,022$). Подсказка снижает скорость перевода, что говорит о независимости семантических полей разных языков.

Было также выявлено, что русскоязычные слова в позиции глагола – синтаксической вершины и существительного в позиции зависимого значимо ускоряют процесс перевода с английского на испанский и, наоборот, значимо тормозят перевод с испанского на английский (рис. 1). Двухфакторный дисперсионный анализ с использованием эpsilon коррекции Юнга-Фельдта показал высокую значимость этих результатов $F(3,012; 66,264) = 3,477, p=0,021$.



Схема 1. Структура пробы



Типы праймов: 1) прайм отсутствует; 2) существительное – зависимое; 3) существительное – вершина; 4) глагол; 5) прилагательное.

По-видимому, можно утверждать, что в использованных экспериментальных условиях при предъявлении русскоязычных праймов, помимо семантической активации, происходит и активизация русского синтаксиса, причем сильнее всего при наличии предикации, т.е. в словосочетаниях типа глагол+существительное.

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О ПРОБЛЕМЕ ИЗУЧЕНИЯ СЛУХОВОГО ВОСПРИЯТИЯ В СРЕДЕ ЦИФРОВЫХ ТЕХНОЛОГИЙ

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В конце прошлого века произошла качественная революция в окружающей человека акустической среде. Развитие современных технологий в области создания способов кодирования аудиоинформации происходит столь высокими темпами, что в течение жизни одного поколения сменилось несколько форматов звукозаписи, однако психологический анализ возможных влияний этих изменений на восприятие звука человеком если и проводится, то уже после внедрения этих технологий на массовый рынок. Возможные негативные тенденции обычно констатируются самими разработчиками техники, а не специалистами в области восприятия (Носуленко, 1988).

Речь идет, например, о создании способов компрессии звука, позволяющих использовать минимальное место на носителе. Вопрос о том, насколько ухудшается при этом качество звука, обычно стоит для разработчика на втором

плане, а ответы на него даются на бытовом уровне («можно записать в двадцать раз больше при незначительном ухудшении качества»). Другая тенденция связана с интенсивным развитием новых технологий синтеза звука. Их применение увеличивает в окружении человека долю «новых» звучаний, у которых нет выраженной отнесенности к источникам в предметном мире. Появление такой «виртуальной» звуковой среды сопряжено с формированием новой предметной области слуховых эталонов у слушателей (Носуленко, 1991). В такой ситуации требуется пересмотреть сами понятия «качество звучания» и «искажение звучания». «Искажение» по отношению к чему? «Качественнее» или «некачественнее» по отношению к какому эталону? Здесь снова встает вопрос о соотношении «естественности» – «искусственности» звучания. Этот вопрос подробно обсуждался в связи с задачами передачи звука из первичного звукового поля («естественного») во вторичное поле (Носуленко, 2007). Однако когда само первичное поле оказывается виртуальным, прямая связь «естественности» с первоисточником звучания не очевидна.

Таким образом, возникают новые задачи изучения восприятия человеком звуков акустической среды, изменяющейся под влиянием информационных и коммуникационных технологий. Для их решения необходимы новые подходы к исследованию восприятия вновь возникающих качеств акустического окружения.

Изучение особенностей восприятия звуков современной акустической среды осуществляется в рамках новой области психофизики, названной «экологической психоакустикой» (Носуленко, 1991). К исследованиям в этой области может быть отнесено большое количество эмпирических работ, направленных на анализ восприятия экологически валидных звуковых событий, составляющих реальное окружение человека (Ballas, 1993; Gygi, Kidd, Watson, 2007 и др.).

В рамках экологической психоакустики предложена парадигма воспринимаемого качества, которая позволяет преодолеть ограничения стимульной парадигмы традиционной психофизики (Носуленко, 2007). Воспринимаемое качество характеризует систему субъективно значимых свойств события, образующих некую стабильную систему. Разработаны процедуры, обеспечивающие «процесс измерения» воспринимаемого качества. В их основе лежит вывод о том, что ключевые характеристики восприятия события проявляются в вербальных суждениях человека. А одним из условий, при которых они становятся репрезентативными индикаторами особенностей перцептивного образа, является ситуация вербального сравнения воспринимаемых событий или их составляющих (Nosulenko, Samoylenko, 1997).

Возможность применения парадигмы воспринимаемого качества для решения задач, связанных с анализом восприятия человеком звуков современной акустической среды, была проверена нами в исследовании, где сравнивались особенности восприятия и оценки человеком цифрового звука разных форматов записи: WAVE и mp3. Результаты показали влияние типа музыкального фрагмента, уровня музыкального образования слушателя, а также решаемой испытуемым задачи на выбор предпочтения способа кодирования и на величину субъективной оценки различия сравниваемых звучаний. При этом выделилась группа испытуемых, для которых звуки, записанные в формате WAVE, воспринимались как «более понравившиеся», а те же звуки, записанные в формате MP3, воспринимались как «более естественные». Анализ вербальных описаний показал существование различных критериев выбора звучаний в разных

ситуациях сравнения (Носуленко, Старикова, 2009).

Проведенное исследование подтвердило эффективность применения выбранной экспериментальной парадигмы. Несмотря на большой набор используемых в эксперименте переменных и некоторую неоднородность группы испытуемых, были получены статистически значимые данные для проверки выдвигаемых гипотез.

Вместе с тем, исследование выявило ряд организационно-технических проблем обеспечения эксперимента. В частности, проблема выбора первичного источника звука для формирования экспериментальных программ. Использование CD-дисков само по себе означает компрессию первичного источника. Остаются вопросы качества применяемых звуковых карт и конечных устройств – усилителей, наушников и т.д. Все это вносит дополнительные неконтролируемые переменные. Для устранения их возможного влияния необходимо перейти на качественно более высокий уровень технического обеспечения.

Учитывая рассмотренные выше тенденции изменений акустической среды, психологический анализ возможных влияний этих изменений на процессы восприятия приобретает особую социальную значимость. В нашем исследовании подтвердилось существование этих влияний, но однозначно говорить об их природе и динамике не позволяет ряд упомянутых организационно-технических проблем, а также отсутствие аналогичных работ. В перспективе предполагается более глубокий анализ полученных фактов и расширение исследований, прежде всего, в направлении их методического обеспечения.

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ИЗУЧЕНИЕ ОСОБЕННОСТЕЙ ВОСПРИЯТИЯ И ИСПОЛЬЗОВАНИЯ ЮМОРА В РАЗНОВОЗРАСТНЫХ И РАЗНОПОЛОВЫХ ГРУППАХ

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Научные исследования в области психологии юмора становятся все более популярными. В современном обществе чувство юмора ценится высоко и является важным атрибутом психического здоровья. В научной литературе описаны различные психологические функции юмора. Часто встречающимися возможностями проявления юмора в жизни человека являются социальное взаимодействие и совладающее поведение. Эти параметры являются основой классификации стилей юмора Р. Мартина (Мартин Р., 2009). В зависимости от направленности юмора выделяется 4 стиля юмора, которые обычно используют люди: с целью повышения групповой сплоченности (аффилиативный), с целью поддержания оптимистичного взгляда на трудности (самоподдерживающий), с целью насмешки над окружающими (агрессивный) или с целью снискания расположения значимых других с помощью насмешек над собой (самоуничижительный) (Martin R.A., Puhlik-Doris P., 2003).

Важной характеристикой чувства юмора является не только то, как человек шутит сам, но и то, как он реагирует на шутки окружающих. В рамках этого вопроса перспективным направлением психологии юмора является изучение понятия гелотофобии, определяющееся как страх выглядеть смешным (Ruch W., Proyer, 2008).

Такие люди, с точки зрения М. Титца, испытывают первичную тревогу, связанную со страхом осмеяния, и убеждены, что они смешны и с ними «что-то не так» (M. Titze, 2009). Деадаптивные особенности таких людей: оценка смеха окружающих скорее как способ принизить, чаще смех над другими, чем с другими, неспособность использовать юмор в качестве копинг-стратегии – существенно влияют на их качество жизни. В своих крайних проявлениях гелотофобия включает в себя более или менее выраженную паранойальность, ранимость, социальную изоляцию.

Однако в жизни можно встретить людей, которые получают удовольствие от ситуаций, в которых они оказываются объектом насмешек.

Такое явление получило название гелотофилия (W. Ruch, R. Proyer, 2009).

Кроме того, существует третья группа людей, которая получает удовольствие, насмехаясь над другими. Феномен получил название катагелластиксизм (W. Ruch, R. Proyer, 2009).

В работе Руха и Проьера катагелластиксизм и гелотофилия являются новыми конструктами и рассматриваются как два направления концепции гелотофобии (W. Ruch, R. Proyer, 2009).

Целью нашего исследования стало изучение разнотовозрастных и разнотоловых особенностей использования юмора, а также особенностей восприятия юмора окружающих.

На основании анализа имеющихся данных были выдвинуты следующие гипотезы исследования:

- В подростковом возрасте более чем в юношеском выражены гелотофобия и катагелластиксизм;
- Мужчины чаще используют агрессивный стиль юмора, чем женщины;
- Для мужчин в большей степени характерно явление катагелластиксизма.

Методика. Опросник «Phophikat» направленный на изучение гелотофобии, гелотофилии и катагелластиксизма [Ruch, W., Proyer, R., 2009]. Опросник на стили юмора Р. Мартина (Мартин Р., 2009).

Выборка состояла из 305 испытуемых: школьников и студентов, среди которых 153 мужчины и 152 женщины, в возрасте от 13 до 19 лет ($M=15.77$, $SD=1.84$).

Статистическая обработка данных. В исследовании были использованы компьютерные программы MS Excel 2003, SPSS 13.0. Применялась процедура корреляционного анализа Пирсона, описательные статистики, корреляционный анализ Пирсона, *t*-критерий Стьюдента.

Исследование показало, что выраженность гелотофобии у учащихся школы в целом значимо выше, чем у студентов ($r=-0.121$, $p=.035$), что подтверждает нашу гипотезу о превалировании страха осмеяния у подростков по сравнению с юношами.

Также получила подтверждение гипотеза о преимущественной склонности мужчин по сравнению с женщинами к агрессивному высмеиванию окружающих ($r=-0.27$ при $p=.00$) и катагелластиксизму ($r=-0.29$ при $p=.00$). Подобные результаты прослеживаются и в других работах, где показано, что гелотофобия и гелотофилия

существуют независимо от демографических переменных, а катагеластизм чаще встречается у людей молодого возраста, мужчин, одиноких (W. Ruch, R. Proyer, 2009).

С возрастом значение самоуничижительного юмора увеличивается ($r=0.139$ при $p=.015$). Поскольку самоуничижительный юмор основан на самокритике, признании своих слабостей и демонстрации их окружающим, то можно предположить, что дети подросткового возраста в силу слабой развитости рефлексии менее склонны к использованию такого стиля юмора по сравнению с юношеским возрастом.

С целью анализа разновозрастных отличий изучаемых признаков, испытуемые были поделены на группы: 13–14 лет, 15–16 лет, 17 лет, 18–19 лет, после чего группы сравнивались между собой по изучаемым параметрам. В результате мы получили отличия группы 13–14 лет от группы 17 лет по агрессивному юмору ($M=3.7$ и 4.1 , $t=-2.2$ при $p=.0028$) и гелотофобии ($M=2.11$ и 1.87 , $t=3.2$ при $p=.004$). Также получены значимые различия в выраженности самоуничижительного юмора в группах 13–14 лет и 18–19 лет ($M=3.26$ и 3.6 соответственно, $t=-2.39$ при $p=.018$). Интересно, что признаки меняются не плавно от группы к группе с возрастом, а

скачкообразно. Отличия прежде всего прослеживаются между группой 13–14 лет и более старшими группами.

Данные исследования являются важным этапом в серии работ по изучению индивидуальных различий особенностей юмора. Полученные результаты позволяют более подробно проследить возрастную динамику особенностей юмора и отношения к нему, а также являются подтверждением некоторых содержательных характеристик подросткового возраста.

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ЭФФЕКТ ДИАПАЗОНА ПРИ ШКАЛИРОВАНИИ ВРЕМЕННЫХ ИНТЕРВАЛОВ: ОНТОГЕНЕТИЧЕСКИЙ АСПЕКТ

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Проблема восприятия времени человеком относится, пожалуй, к числу «вечных» проблем. Человек с самого рождения оказывается «вписанным» во временные рамки не только физической, но и социальной среды. От того, насколько адекватным будет восприятие временного континуума, будет зависеть не только благополучие человека как биологического существа, но и как активного члена общества. Для решения этой проблемы сделано немало. Исследованы физиологические механизмы восприятия времени на разных уровнях организации живого, начиная с клеточного и кончая системным (Бушов и др. 2007, 2009). Достаточно подробно изучено влияние различного рода факторов на восприятие времени (Багрова 1980; Садов, Шпагонова 2007: 297–303), среди

которых важную роль играет возраст человека (Сурнина 1999).

Однако абсолютное большинство работ по данной проблеме ведется в рамках лабораторного эксперимента, где испытуемый должен шкалировать (оценивать, отмеривать, воспроизводить и т.д.) длительность временных интервалов, заданных достаточно простыми стимулами. Как правило, это короткие интервалы, не превышающие несколько минут.

А как будут оцениваться интервалы, измеряемые годами? Ведь человек не остается равнодушным к пройденным этапам своей жизни, о чем свидетельствуют метафоричные сравнения времени со стрелой, водой, тянущейся резиной и т.д. На бытовом уровне мы нередко сталкиваемся с суждением старых и пожилых людей о мимолетности, скоротечности жизни. У молодых людей, напротив, о длинном жизненном пути, на котором все можно успеть сделать. Рассуждения такого рода по своей сути – психофизическая проблема соотношения реальной длительности прожитого отрезка жизненного

пути и его субъективной оценки, длительности физического времени и его ментальной репрезентации.

Поскольку длительность пройденного жизненного пути у молодых и пожилых людей разная, то можно предположить, что при ее оценке будет иметь место известный в психофизике эффект диапазона. Он заключается в том, что крутизна психофизической функции оценки, а, следовательно, и экспонента Стивенса, имеет тенденцию уменьшаться при увеличении физического диапазона предъявляемых сигналов. Этот феномен хорошо известен для разных модальностей (Stevens, Poulton 1956: 71–78; Лупандин 1989). По отношению ко времени его проявление обнаружено для коротких длительностей (Лупандин, Сурнина 1991), но не исследовано по отношению к временным интервалам биографического масштаба.

Целью нашего исследования было подтвердить (или опровергнуть) гипотезу о проявлении эффекта диапазона при шкалировании длительностей биографического масштаба.

В исследовании приняли участие три группы испытуемых, различающихся между собой по возрасту: 1) 163 человека (студенты) в возрасте от 17 до 23 лет (50 мужчин и 113 женщин); 2) 80 человек в возрасте от 55 до 74 лет (20 мужчин и 60 женщин); 3) 20 человек от 74 до 95 лет (5 мужчин, 15 женщин).

Для изучения восприятия испытуемыми «длительных» интервалов, продолжительность которых сопоставима с масштабом человеческой жизни, применялся метод кросс-модального подбора. Испытуемому предъявлялась начерченная на бумаге горизонтальная линия длиной 200 мм. В инструкции указывалось, что предъявленная линия представляет собой жизненный путь испытуемого от рождения до момента тестирования. Далее предлагалось выделить пять наиболее важных для испытуемого жизненных событий, которые он хотел бы отметить на «линии жизни». В качестве событий рассматривались любые значимые изменения во всех сферах жизни. Испытуемый записывал их в хронологическом порядке на обратной стороне бланка. После этого его просили начертить линию, соответствующую длительности промежутка времени от рождения до первого указанного события, затем от рождения до второго указанного события и т.д.

У каждого испытуемого вычислялось значение показателя степени (экспоненты Стивенса) психофизической функции оценки длительностей этапов жизненного пути. При этом в качестве независимой переменной служил

хронологический возраст (в годах), зависима переменная – длина линии, соответствующей тому или иному временному промежутку. Соответствие субъективной временной шкалы физической шкале оценивалось по величине экспоненты Стивенса. В случае пропорциональной оценки временных интервалов показатель степени должен быть равен единице, а субъективная шкала времени полностью соответствует физической. Если же такая пропорциональность не соблюдается, то экспонента будет отклоняться от единицы в ту или другую сторону. И если наша гипотеза верна, то экспонента с возрастом должна уменьшаться.

Было обнаружено, что с возрастом экспонента Стивенса закономерно уменьшается, т.е. происходит сужение субъективной шкалы времени по сравнению с физической шкалой (1,72, 0,90, 0,83, соответственно в трех возрастных группах). Проявление этого эффекта можно объяснить плотностью стимульного ряда. У молодых людей отмеченные события расположены ближе друг к другу, плотнее, и, по-видимому, ввиду значимости событий, интервалы между ними переоцениваются, «растягивая» шкалу. У испытуемых старших возрастных групп при увеличении диапазона стимулов их плотность уменьшается, имеет место недооценка интервалов между событиями и, как следствие, сужение субъективной шкалы времени.

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АССОЦИАТИВНОЕ ЗАПОМИНАНИЕ И ВОСПРОИЗВЕДЕНИЕ СЛОЖНЫХ ПАТТЕРНОВ

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Одним из удивительных свойств человеческой памяти является ее ассоциативность. И это ее свойство всегда привлекало внимание исследователей, стремящихся понять принципы организации и алгоритмы функционирования структур мозга.

Наиболее ранней моделью, способной обеспечивать ассоциативность запоминания и воспроизведения образов, была ассоциативная память Хопфилда [1].

В наиболее общем виде ассоциативную память можно описать следующим образом.

Пусть x_1^p, \dots, x_M^p набор эталонных образов, каждый из которых представляет собой вектор размерностью N (x_1^h, \dots, x_N^h).

Для запоминания формируется матрица межнейронных связей $R = [r_{ij}]$, размерностью $N \times N$, которая описывается выражением:

$$r_{ij} = \sum_{h=1}^M x_i^h x_j^h \quad i, j = \overline{1, N}$$

Воспроизведение образа заключается в умножении матрицы на вектор-изображение с последующим поэлементным применением нелинейной пороговой операции:

$$x_j^{new} = f \left(\sum_{i=1}^N x_i r_{ij} x_j^{old} \right) \quad j = \overline{1, N}$$

где обычно рассматривается пороговая функция f .

Действительно эта модель оказывается способной воспроизводить запомненные образы даже при предъявлении только их части, то есть обеспечивать ассоциативность.

Для запоминания разреженных образов, то есть образов, в которых ключевые элементы составляют только небольшую часть по сравнению с общим размером запоминаемой области, был предложен вариант интерпретации традиционной ассоциативной памяти Хопфилда в векторном виде [2, 3].

В случае разреженного образа большинство элементов матрицы межнейронных связей не несут никакой информации и могут быть опущены. Запоминанию подлежат только связи, описывающие взаимодействие ненулевых элементов запомненных образов. Для каждой пары непустых элементов запоминаемого образа фиксируются их координаты (i_1, i_2).

Предложена наглядная интерпретация в виде пучка векторов, выходящих из каждого ненулевого элемента образа во все остальные ненулевые элементы.

Для воспроизведения запомненные вектора с противоположным направлением прикладываются к соответствующим ненулевым элементам представленного для воспроизведения изображения. То есть среди всех запомненных векторов воспроизводятся только те, которые имеют в месте своего начала ненулевую ячейку. Ячейки, на которые указывают полученные вектора, принимают единичное значение. При этом возможно применение пороговой обработки, обычно используемой в ассоциативной памяти. Такой вариант организации вычислений функционально полностью аналогичен традиционному, но за счет использования разреженной структуры запоминаемого и воспроизводимого образа позволяет более эффективно использовать вычислительные мощности.

Для обеспечения воспроизведения запомненных образов в инвариантном относительно сдвигов виде предложено обобщение традиционной модели Хопфилда и его наглядной интерпретации [2, 3].

Для этого предложено связи и воспроизведение образа рассчитывать согласно выражениям:

$$r_{ij} = x_j x_{i+j} \quad y_i = f \left(\sum_j x_{i+j} r_{ji} \right)$$

Запоминание образа осуществляется аналогично неинвариантному случаю, то есть запоминаются все вектора, соединяющие ненулевые элементы изображения.

При воспроизведении к каждому ненулевому элементу образа для воспроизведения прикладывается вектор, обратный запомненному. Отличие от неинвариантной версии, при которой запомненный вектор прикладывается к единственной соответствующей ему точке изображения, заключается в том, что в качестве точек приложения векторов рассматриваются все возможные варианты ненулевых элементов воспроизводимого образа.

Наряду с прямой моделью ассоциативной сети Хопфилда со связями между двумя элементами образа, в аналогичном виде могут быть рассмотрены ассоциативные сети и более высоких порядков, когда рассматриваются

взаимоотношения между тремя и более элементами образа.

Рассмотренная инвариантная модель ассоциативной памяти может быть успешно применена для разнообразных приложений, в том числе при траекторной обработке радиолокационной информации, при анализе ситуаций, при обнаружении вторжений в компьютерные сети и др. [2,3]

В указанной модели при запоминании и воспроизведении полагается, что ключевые элементы запоминаемых образов имеют одинаковую значимость и взаимосвязи между ними равноправны. Однако это справедливо только для простейших образов, состоящих из одинаковых элементов. В действительности образы имеют сложную структуру, часто иерархически организованную. Отдельные ключевые элементы образа имеют различную значимость, и уровни взаимосвязи между ними могут значительно различаться. Для учета различной значимости отдельных частей образа и взаимосвязей между ними предлагается осуществлять взвешивание межнейронных связей, то есть воспроизведение осуществлять, в соответствии с выражением

$$y_i = f \left(\sum_j a_j x_{i+j} r_{ji} \right)$$

Кроме того, воспроизведение осуществляется на различных уровнях иерархии, обеспечивая воспроизведение сначала верхних уровней и затем, уже внутри воспроизведенных элементов восстанавливаются частные элементы образа.

Такая модель, представленная в предложенной векторной интерпретации, оказывается очень близка к идее ассоциативных механизмов памяти, обеспечивающих сложное иерархическое формирование связей между понятиями [4].

Проведенные эксперименты на модельных задачах показали хорошее качество воспроизведения образов при относительно невысоких затрачиваемых вычислительных ресурсах.

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ВОССТАНОВЛЕНИЕ ФАРМАКОЛОГИЧЕСКИ НАРУШЕННОЙ ПАМЯТИ: ИССЛЕДОВАНИЕ ЭКСПРЕССИИ ТРАНСКРИПЦИОННЫХ ФАКТОРОВ В МОЗГЕ НА МОДЕЛИ ПАССИВНОГО ИЗБЕГАНИЯ У ЦЫПЛЯТ

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Формирование долговременной памяти требует синтеза новых белков в мозге (Davis and Squire 1984; McGaugh 2000). Нарушение синтеза белка во время обучения препятствует консолидации памяти и приводит к амнезии, которая долгое время считалась необратимой (Mark and Watts 1971; Patterson et al. 1986; Anokhin et al. 2002). В то же время, в экспериментальных моделях на животных показано, что в некоторых случаях нарушенную память можно восстановить с помощью процедуры «напоминания» (Mactutus et al. 1982; Radyushkin and Anokhin 1999). В основу настоящей работы положена гипотеза, что мозг с нарушенной памятью

сохраняет фрагменты диссоциированных функциональных систем, лежащих в основе воспоминаний. Эти компоненты могут быть вновь интегрированы в целостную систему и манифестироваться на уровне поведения, если инициировать этот процесс определенными стимулирующими воздействиями. Хотя природа восстановления памяти напоминанием остается пока неизвестной, на модели пассивного избегания у цыплят показано, что процесс восстановления занимает 6–8 часов и зависит от синтеза белка (Radyushkin and Anokhin 1999). Исходя из этого, мы предположили, что процесс восстановления памяти при напоминании должен индуцировать транскрипционную активность в тех областях мозга, которые поддерживают фрагменты нарушенной памяти. В настоящей работе исследована экспрессия транскрипционных факторов c-Fos и ZENK в мозге цыплят при обращении к нормальной и нарушенной памяти.

Однодневных цыплят (*Gallus gallus domesticus*) обучали в стандартной модели однократного пассивного избегания (Rose 1991). В результате обучения цыплята научаются избегать клевания аверсивного объекта, предъявленного во время обучения. За 5 мин до обучения животным вводили ингибитор синтеза белка (анизомидин, 80 мкг) билатерально в боковые желудочки мозга. Контрольная группа получала инъекции физраствора (группа Контроль). Через 24 ч после обучения части животных проводили процедуру напоминания, заключающуюся в обучении на новый аверсивный объект. Всех животных тестировали через 48 ч после обучения. Результаты тестирования показали, что в группе ненарушенной памяти (Контроль) уровень избегания был достоверно выше, чем в группе нарушенной памяти (75% и 35% соответственно, $p < .01$ по критерию Манна-Уитни). Таким образом, блокада синтеза белка в мозге во время обучения приводила к невозможности формирования долговременной памяти. В то же время уровень избегания в группе, обученной на фоне блокады синтеза белка, но получавшей напоминание, составлял 67% ($p < .05$ по сравнению с группой нарушенной памяти). Полученные данные показывают, что реактивация памяти, фармакологически нарушенной во время обучения, приводила к ее восстановлению на уровне поведения. Таким образом, несмотря на выраженную амнезию у животных, получавших ингибитор синтеза белка, память о ранее приобретенном опыте могла быть восстановлена до уровня поведенческой манифестации путем процедуры напоминания. Дальнейшие эксперименты были направлены на исследование механизмов поддержания нарушенной, но не уничтоженной памяти, и локализации субстрата, обеспечивающего ее поддержание.

Исследование транскрипционной активности в мозге было проведено на четырех группах животных: (1) реактивация нормальной памяти (напоминание после обучения на фоне физраствора); (2) реактивация нарушенной памяти (напоминание после обучения на фоне анизомидина); (3) формирование памяти (обучение на новый объект, без предварительного опыта); (4) пассивный контроль. Животных экспериментальных групп декапитировали через 90 мин после напоминания (Гр.1 и 2) или после обучения (Гр.3); животных группы пассивного контроля брали из домашних клеток. Экспрессию транскрипционных факторов c-Fos и ZENK исследовали методом иммуногистохимии на срезах мозга.

Анализ активности транскрипционных факторов c-Fos и ZENK в мозге цыплят показал, что распределение активности при восстановлении нарушенной памяти отличается от паттернов активности мозга животных с реактивацией нормальной памяти. Кроме того, оно отличается и от активности мозга «наивных» необученных животных, не имевших предварительного опыта. Так, в области промежуточного медиального мезопаллиума, играющей ключевую роль в формировании памяти в данной модели, наблюдалось снижение уровня экспрессии обоих транскрипционных факторов при реактивации нормальной памяти; в то время как запуск реинтеграции нарушенной памяти вызывал увеличение содержания c-Fos и ZENK в этой области. Кроме того, в ряде структур мозга (медиальный стриатум, гиппокамп) индукция по крайней мере одного из генов наблюдалась лишь при обучении и реактивации нормальной, но не нарушенной памяти; в других областях мозга (дорзальный гиперпаллиум, промежуточный аркопаллиум) уровень экспрессии был сопоставим у животных с нормальной и нарушенной памятью.

Таким образом, анализ экспрессии транскрипционных факторов в мозге выявил области, специфически активирующиеся при напоминающем воздействии. На уровне поведения результатом этого воздействия является феномен «восстановления памяти». Сопоставление полученных результатов позволяет предположить, что специфическая транскрипционная активность при напоминании маркирует структуры и области, поддерживающие в мозге амнестичных животных следы памяти, которые в результате процедуры напоминания реинтегрируются и обеспечивают восстановление памяти.

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ФИЗИОЛОГИЧЕСКИЕ ПОКАЗАТЕЛИ СНИЖЕНИЯ УРОВНЯ БОДРСТВОВАНИЯ ПРИ ВЫПОЛНЕНИИ МОНОТОННОЙ ОПЕРАТОРСКОЙ ДЕЯТЕЛЬНОСТИ

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В современном обществе широко распространена операторская деятельность, ошибки в которой могут иметь серьёзные последствия вплоть до человеческих жертв (водители, диспетчеры и т.д.). В то же время до настоящего времени не разработано достаточно эффективных методов контроля состояния оператора в режиме реального времени. Это делает актуальной задачу автоматизированного распознавания состояния оператора по физиологическим показателям.

В настоящее время наиболее перспективными физиологическими коррелятами ранних стадий засыпания считаются электроэнцефалограмма (ЭЭГ) и движения глаз. Однако общеизвестно, что эти показатели имеют большую межиндивидуальную вариабельность. Это затрудняет применение унифицированных критериев распознавания состояния оператора. С другой стороны, широкое распространение компьютеров делает возможным применение для этих целей гибких алгоритмов, способных подстроиться под индивидуальный паттерн реакций испытуемого на снижение уровня бодрствования.

В нашем исследовании сравниваются возможности распознавания ранних стадий дремоты по ЭЭГ методами CSP (Koles Z.J. 1991) и Байеса (Fukunaga K. 1990), позволяющими учесть индивидуальные различия испытуемых, а также распознавание по ЭКГ и некоторым параметрам движений глаз.

Эксперименты проводились на компьютерном симуляторе вождения автомобиля с участием здоровых испытуемых в состоянии частичной депривации сна.

В экспериментах регистрировались: ЭЭГ по системе 10–20, ЭКГ, направление взгляда испытуемого (система Eyegaze Development System, USA), параметры траектории движения автомобиля в компьютерном симуляторе, а также видеозапись лица испытуемого. Видеозапись,

оцененная двумя экспертами, и траектория движения автомобиля служили критериями состояния испытуемого, с которыми сравнивались физиологические показатели. Все показатели усреднялись по 15-секундным интервалам, поскольку развитие дремотного состояния имеет среднее время порядка десятков секунд (Makeig S. 2000).

Наши эксперименты показали хорошую эффективность распознавания методами CSP и Байеса по сравнению с экспертной оценкой (75–95%). Эффективность метода Байеса оказалась несколько выше.

Из выбранных для анализа окулomotorных показателей выраженную корреляцию с оценкой экспертов показали т.н. расфокусировка взгляда испытуемого и средняя длина саккады. Остальные параметры не показали высокой корреляции с экспертной оценкой, как и ЭКГ (вариабельность интервала между соседними сокращениями).

Анализ вклада в компоненту, полученную методом CSP, электрической активности различных регионов мозга показал, что в основном на ранних стадиях дремоты происходят изменения во фронтальных областях, что находится в согласии с общепринятыми представлениями (Klimesch W. et al. 2007) об изменении ЭЭГ при наступлении дремотного состояния.

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МЕТАФОРЫ, КОТОРЫМИ МЫ НЕ ЖИВЕМ!

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В статье даются разъяснения, как работают метафоры, выражающие намерения и мотивации человека информационной эпохи. Главная задача авторов – показать на примерах речевых коммуникаций современного человека, как вполне конкретные намерения выражаются ложными метафорами, а доминирующей причиной для того или иного поступка современного человека является достижение успеха (ср. Zipf 1949: 19, Keller and Kirschbaum 2003: 12). В статье утверждается, что в силу максимизации правды разумный человек информационной эпохи не может «жить метафорами» (см. Lakoff and Johnson 1980, 1999 и многочисленные работы их последователей), прекрасно понимая, что они изначально являются абсолютной ложью (Davidson 1978: 42–43). В противоположность расхожей практике бесконтрольного, то есть полностью бессознательного употребления метафор в повседневном обиходе – развлечения и разнообразия ради (на основе чего были сделаны ложные выводы, что «люди метафорами живут») – мы предлагаем следующую модель, которая, по нашему убеждению, соответствует мышлению и, в конечном итоге, предельно осознанному поведению современного человека. Метафора не есть перенос домена-источника (source domain) на домен-цель (target domain), как определяется Лакоффом и его последователями, а частичное разрушение как онтологической, так и эпистемной структуры исходного концепта. (Апресян 1967, Tokar 2009). Например, носитель русского языка, говорящий о «*нападках* оппозиции на правительство», не реализует концептуальную метафору «спор – это война», а разрушает исходную структуру концепта «война», то есть удаляет из этого концепта, например, элемент «насилие», характерный для концепта «война», но нехарактерный для концепта «спор»: оппозиция, «*нападающая* на правительство», не применяет никакого насилия по отношению к правительству, а всего лишь сильно критикует его. А если спор все же сопровождается применением насилия (как это, например, недавно произошло в эфире одной телевизионной передачи <http://www.youtube.com/watch?v=IC13h97EV2M>), то это не есть следствие метафорического понимания домена-цели

«спор» посредством домена-источника «война» или «драка», а всего лишь банальный переход спора в драку. Если бы люди действительно «жили» метафорой «спор – это война / драка», то любой спор всегда бы сопровождался применением насилия, за которое никто бы никого никогда не наказывал.

Помимо критики общей концепции когнитивной теории метафоры, мы также докажем ошибочность выводов, сделанных Дж. Лакоффом в ряде его последних работ, посвященных политическому дискурсу в современной Америке (Lakoff 2004, Lakoff 2006a, Lakoff 2006b, Lakoff and Wehling 2008). В частности, Лакоффом утверждается, что консервативная идеология Республиканской Партии США основана на концептуальной метафоре «государство – это строгий отец» (strict father metaphor), тогда как в основе либеральной идеологии Демократической Партии находится концептуальная метафора «государство – это заботящийся родитель» (nurturant parent metaphor). Например, различия между республиканцами и демократами в вопросе всеобщего медицинского страхования обусловлены, по мнению Лакоффа, именно этими метафорами: если для демократов государство – это заботящийся родитель, который должен обеспечить своих детей (т.е. граждан Америки) всем необходимым (в том числе и медицинской страховкой), то для республиканцев государство – это строгий родитель, который имеет полное право поощрять одних (т.е. дать «послушным детям» возможность добиться социального успеха со всеми вытекающими отсюда социальными благами) и наказывать других (лишить «непослушных детей» этих благ, если они себя очень плохо вели).

Как мы покажем, ошибочность данного вывода Лакоффа связана не только с ошибочностью его общей концепции когнитивной теории метафоры: ни республиканцы, ни демократы не «живут» метафорами «государство – это строгий отец» и «государство – это заботящийся родитель», поскольку, будучи абсолютной ложью, метафоры для реальной жизни не пригодны (ср. критику этих метафор в книге Nunberg 2006). Помимо этого, Лакофф забыл учесть, что любого политического деятеля интересует в первую очередь свой собственный успех, а не судьба какого-то неизвестного ему человека, у которого нету медицинской страховки или каких-то других социальных благ. То есть, господина Обаму, защищавшего введение всеобщего медицинского страхования в США,

абсолютно не интересовала судьба миллионов американцев, которые из-за отсутствия медицинской страховки не могли обратиться за медицинской помощью: отстаивая необходимость введения всеобщего медицинского страхования, президент не «жил» метафорой «государство — это заботящийся родитель» (то есть ни о ком заботиться не собирался изначально), а всего лишь проявлял свою псевдо-эмпатию, то есть стремление показать, что ему якобы не чужды страдания других людей. На самом деле, это, как сказано выше, конечно же, не так.

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КОНЦЕПТУАЛЬНЫЕ МЕТАФОРЫ С ИСТОЧНИКОВЫМ ДОМЕНОМ FOOD, ЛЕЖАЩИЕ В ОСНОВЕ МОДЕЛИРОВАНИЯ ЛЕКСИЧЕСКОГО ЗНАЧЕНИЯ ГЕНДЕРНО-МАРКИРОВАННЫХ ОЦЕНОЧНЫХ СУЩЕСТВИТЕЛЬНЫХ

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В данной статье речь пойдет о гендерных концептуальных метафорах как о способе моделирования лексического значения предикатных существительных в современном английском языке. Как известно, процесс познания, когнитивности ничем не ограничивается и беспределен во времени. Языковые ресурсы же, напротив, ограничены, лимитированы. Поэтому в процессе познания окружающего мира, расширения спектра знаний в различных областях возникает необходимость повторного использования одного и того же комплекса звуков для обозначения нескольких явлений, неким образом связанных между собой. Возникающая при этом семантическая неоднозначность дает возможность экономно использовать ресурсы языка и при этом удовлетворить все человеческие потребности, возникающие в процессе коммуникации.

Большинство категорий естественных языков представляют собой полисемичные категории, т.е. категории, обладающие двумя и более значениями одной лингвистической

формы. Исходя из этого, очень важно обратиться к анализу языкового феномена полисемии на примере метафорических значений, которые, как известно, представляют собой намеренную категориальную ошибку [Рикер 1990].

Метафора одновременно и зависит от полисемии, и порождает ее. Если бы слова имели одно значение, метафора была бы невозможна, равно как она невозможна, если бы все слова были многозначными. Процесс порождения метафоры может рассматриваться не только с точки зрения создания новых лингвистических явлений. Это результат определенных когнитивных процессов, которые открывают новые возможности для знакомых значений. Когнитивная лингвистика рассматривает метафору как способ, с помощью которого абстрактные и, казалось бы, несовместимые области человеческого знания и опыта концептуализируются как нечто знакомое и конкретное.

В ходе анализа оценочного значения существительных были выявлены следующие гендерные концептуальные метафоры с источником доменом FOOD:

- WOMEN ARE DESSERTS (*cake, tart, jelly, crumpet* и т.д.),
- WOMEN ARE SWEET THINGS (*sugar, honey* и т.д.),

- WOMEN ARE FRUIT (*plum, tomato* и т.д.) и
- MEN ARE FOOD/MEAT (*meat, beefcake, beef* и т.д.).

Поскольку в фокусе нашего исследования находятся источниковые домены, нам представляется целесообразным выстроить иерархию концептуальных метафор с учетом значения слов-источниковых доменов. Такая иерархия схематично представлена на рисунке 1, где концептуальная метафора PEOPLE ARE FOOD располагается на суперординантном уровне, метафоры WOMEN ARE SWEET THINGS, MEN ARE MEAT, WOMEN ARE FRUIT – на базисном уровне, а метафора WOMEN ARE DESSERTS находится на субординантном уровне.

Мы видим, что большая часть концептуальных метафор, характеризующих женщин, представлена на всех трех уровнях, в то время как концептуальная метафора, характеризующая мужчин, располагается только на суперординантном и базисном уровнях. Это дает нам

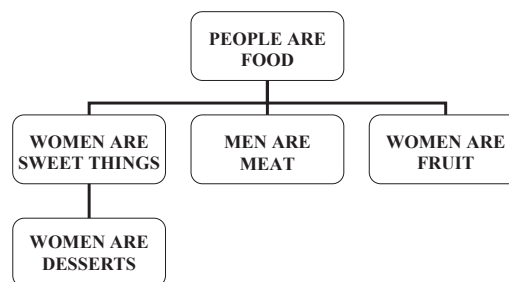


Рисунок 1.

возможность сделать следующий вывод – несмотря на меняющиеся социальные роли мужчин и женщин и все большее взаимопроникновение «гендерлектов», мы все еще можем проследить остаточные проявления «мужского доминирования» (men's dominance) в речи, выражающиеся в том, что мужчины гораздо свободнее сообщают характеристику противоположному полу, тем самым порождая большее количество реализаций концептуальных метафор на всех представленных уровнях.

ЭПИГЕНЕТИЧЕСКИЙ КОНТРОЛЬ КОГНИТИВНЫХ ФУНКЦИЙ: УСИЛЕНИЕ АЦЕТИЛИРОВАНИЯ ГИСТОНОВ СТИМУЛИРУЕТ СЛАБУЮ ПАМЯТЬ И ЭКСПРЕССИЮ РАННИХ ГЕНОВ В МОЗГЕ

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Современные представления о механизмах обучения и памяти основаны на представлении о кратковременной и долговременной формах хранения информации в мозге человека и животных. Как на когнитивно-поведенческом, так и на молекулярно-клеточном уровне выделяют две последовательные фазы сохранения следа памяти в мозге: кратковременную, зависящую от активности нейронов; и долговременную, связанную с пластическими перестройками синапсов (Hebb 1949). Процесс перехода памяти из кратковременной в долговременную форму был назван консолидацией памяти (Muller and Pilzecker 1900). Консолидация памяти требует активации каскада клеточных процессов, запускающегося в нейронах при обучении и приводящего к экспрессии генов, обеспечивающих модификацию синапсов (Dudai 2004). Данный каскад является универсальным и необходим для консолидации долговременной памяти у

всех исследованных групп животных, от беспозвоночных до птиц и высших млекопитающих, включая человека.

Долговременные изменения в экспрессии генов, вовлеченных в консолидацию памяти, находятся под контролем эпигенетических процессов, таких, как ацетилирование гистоновых белков (Levenson et al. 2004). В связи с этим, целью данной работы было проверить предположение о том, что перевод памяти из «слабой» (угасающей) в устойчивую долговременную форму может быть инициирован повышением уровня ацетилирования гистонов в клетках мозга во время консолидации. Кроме того, в работе проверялось, может ли подобное повышение ацетилирования гистонов, вызванное блокадой гистондеацетилаз (HDAC), усиливать экспрессию генов, вовлеченных в консолидацию долговременной памяти.

В работе использовалась методика «слабого» однократного обучения пассивному избеганию цыплят в возрасте 1–3 суток (Crowe et al. 1989). В основе данного обучения лежит предрасположенность новорожденных цыплят клевать небольшие яркие объекты. Обучение состоит в предъявлении цыпленку бусины, смоченной

веществом, имеющим жгучий вкус. Цыплянок, клонувший такую бусину, демонстрирует аверсивную реакцию и при последующих предъявлениях такой же, но сухой бусины, избегает ее. «Слабое» обучение пассивному избеганию приводит к формированию памяти, которая сохраняется на протяжении 6–9 часов, а впоследствии угасает; при тестировании через 24 часа эта память уже не проявляется в поведении (Gibbs and Summers 2002).

Было показано, что внутримозговое введение ингибитора HDAC валпроата натрия в дозе 100 мг/кг за 30 мин до «слабого» обучения приводит к достоверному повышению избегания «аверсивного» объекта (бусины) в тесте через 24 ч после обучения. Так, в контрольной группе бусину, на которую проводилось обучение, избегало 15% цыплят, тогда как в группе, получавшей инъекцию валпроата натрия – 70% животных ($p=0.0004$, критерий χ^2). В эксперименте с внутримозговым введением другого ингибитора HDAC, трихостатина А (TSA), были получены аналогичные результаты. Билатеральное введение TSA в боковые желудочки мозга цыплят за 30 мин до обучения улучшало воспроизведение навыка пассивного избегания при тестировании через 24 ч после обучения, причем дозозависимым образом. Так, в контрольной группе «аверсивную» бусину избегало 33% животных; в группе, получавшей TSA в дозе 1 мкг, – 56%; в группе, получавшей 2 мкг TSA, – 72%; в группе «10 мкг TSA» – 78%. Повышение уровня избегания «аверсивной» бусины при введении TSA было достоверно для доз 2 мкг и 10 мкг ($p=0.0194$ и $p=0.0073$ соответственно, критерий χ^2).

Таким образом, блокада гистондеацетилазы при «слабом» обучении приводила к формированию устойчивой долговременной памяти, сохранявшейся в течение по крайней мере 24 ч. Сопоставимые эффекты системного и внутримозгового введения ингибиторов HDAC указывают на их специфическое действие на когнитивные процессы, поскольку внутримозговое введение сводит к минимуму возможность побочных эффектов, способных усилить «слабое» аверсивное обучение.

Известно, что формирование долговременной памяти обеспечивается двумя фазами экспрессии генов: сразу после обучения начинается экспрессия «немедленных ранних» генов, а через 4–6 часов происходит экспрессия «поздних», эффекторных генов (Izquierdo et al. 2006). Оба ингибитора HDAC оказывали усиливающее влияние на память при введении до обучения, то есть повышение уровня ацетилирования

гистонов потенцировало ранние стадии консолидации памяти. В связи с этим было исследовано влияние блокады HDAC на экспрессию «немедленных ранних» генов ZENK и c-fos, активация которых критически необходима для формирования долговременной памяти (Анохин 1997).

Было обнаружено, что внутримозговое введение TSA в дозе 2 мкг приводит к достоверному повышению уровня экспрессии гена ZENK в высших интегративных, ассоциативных и моторных областях мозга цыплят, необходимых для формирования памяти в «сильной» версии пассивного избегания, но не влияет значительно на экспрессию c-fos в данных структурах. Напротив, в интегративных сенсомоторных структурах введение TSA вызывало повышение экспрессии c-fos, но не ZENK. Различия в паттерне индуцированной TSA экспрессии ZENK и c-fos говорит о высоко специализированной роли каждого из этих генов в обеспечении когнитивных функций мозга цыплят.

Таким образом, полученные нами результаты указывают на возможность перевода угасающей «слабой» памяти в долговременную форму при помощи фармакологических воздействий, модулирующих ранние этапы молекулярного каскада консолидации памяти. Кроме того, были выявлены кандидатные гены, дифференцированная экспрессия которых в различных структурах мозга может обеспечивать перевод памяти в устойчивое состояние.

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О ПРОЦЕССАХ КАТЕГОРИЗАЦИИ В ТИПОЛОГИЧЕСКОМ РАКУРСЕ (НА МАТЕРИАЛЕ СЕМАНТИЗАЦИЙ СОМАТИЗМОВ)

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Семантизация – процесс выявления значения слова, а также результат этого процесса. По отношению к норме семантизация может быть *кодифицированной* или *интуитивной*. Кодифицированная семантизация – это толкование слова, зафиксированное в словаре как нормативное. В данной работе семантизация рассматривается с точки зрения вербальной экспликации в ней когнитивных процессов. Поэтому большой интерес представляет не обработанная, а естественная (*интуитивная*) семантизация. Интуитивная семантизация – набор семантических признаков и стратегий, находящихся в отношениях жесткой или свободной корреляции; это один из экспериментальных способов выявить, какой из семантических признаков слова является для носителя языка наиболее значимым. Несмотря на принципиальное разграничение кодифицированных и интуитивных толкований, они находятся в отношениях взаимовлияния: профессиональная деятельность лингвиста зависит от его интуитивных лингвистических представлений, а зафиксированные в словарях дефиниции формируют метаязыковые навыки носителя языка. Не секрет и то, что при создании толковых словарей учитывается лексикографический опыт как частного, так и общего языкознания. Следовательно, вполне ожидаемым фактом является формальное совпадение в некоторых случаях кодифицированной и интуитивной дефиниции или кодифицированных толкований разноязычных словарей, и особого внимания заслуживают контрастные области, как во внутриязыковом, так и в межьязыковом пространстве.

Материалом для данного исследования послужили интуитивные семантизации соматизмов (лексических единиц, номинирующих части тела), полученные от 1) носителей русского языка (100 анкет), 2) носителей китайского языка, слабо владеющих русским языком (10 анкет), 3) носителей алтайского языка – билингвов (7 анкет). Во всех случаях эксперимент проводился на родном языке испытуемых. В экспериментальной анкете информантам предлагалось дать первое пришедшее в голову толкование к приведенным частям человеческого тела (26 единиц,

составляющих список кросс-культурных исследований Сектора психолингвистики и теории коммуникации ИЯ РАН). Соматизмы в типологическом аспекте представляют большой интерес, поскольку позволяют видеть, как статичная для разных этносов данность – тело человека – может по-разному концептуализироваться в различных картинах мира. Выбор языков не случаен – они представляют различные типы: флективный, изолирующий, агглютинативный. Таким образом, подобное сравнение позволит подойти к решению вопроса, зависят ли (и если да, то в какой степени) процессы категоризации от типологических характеристик родного языка информанта.

При обработке всех полученных анкет ставились следующие вопросы: 1) один или несколько категориальных признаков эксплицируется в толковании; 2) какие именно категориальные признаки были описаны; 3) как маркированы данные категории в семантизации; 4) какие метаязыковые средства (насколько разнообразные, прямо или косвенно указывающие на семантический признак) используются для описания категории.

Сопоставительный анализ результатов русского и китайского эксперимента показал:

1. Больше разнообразие репрезентированных в толковании категориальных признаков в китайском языке, чем в русском: русские семантизации обычно тяготеют к единственной категоризации, китайские нередко используют все разнообразие признаков («пространство» + «функция» + «количественность» + «форма» или «структура»). Более того, русская интуитивная дефиниция нередко ограничивается родовым признаком («часть тела», «часть лица»), направленным на общую ориентацию, китайская, напротив, склонна к развернутости.

2. И в русском, и в китайском языке, и в кодифицированных, и в интуитивных толкованиях доминирующей категорией является пространственная. Тем не менее, могут принципиально отличаться способы ее реализации, в частности, отсчет «по горизонтали» или «по вертикали», т.е. ориентирами при пространственном описании китайскими информантами соматизмов оказываются соположенные в горизонтальной плоскости соматизмы, у русских чаще – «вертикальные соседи».

3. Интуитивные семантизации и у русских, и у китайцев в большей степени, чем кодифицированные, эксплуатируют «функциональные»

признаки, причем специфическое функциональное назначение приобретают практически все соматизмы, о чем сигнализируют маркеры категории: русск. *скула* – «*жуёт пищу*» («*помощник челюсти по жеванию*»), *рука* – «*хватательный орган*», *рот* – «*аппарат для еды*», кит. *xiàba* (подбородок) – «*kéyǐ dòng*» (способный двигаться), *zǔichun* (губы) – «*kéyǐ bǎohu zǔi*» (способны защищать рот), «*yòng lái bǎohu ...*» (применяются для защиты).

4. В наибольшей степени контрастируют субъектно- (способность рассматриваться как субъект) объектная (проявление принадлежности) соотносительности: в китайских дефинициях часть тела нередко выступает как субъект, что не характерно для русских; в русских семантизациях используется принадлежность говорящему (*рот* – «мы им едим», *локоть* – «помогает нам сгибать руку», *зад* – «на чем сидим»), ни разу не встретившаяся в китайских интуитивных толкованиях.

5. Существенное различие обнаруживается в реализации количественных характеристик соматизмов. В русских интуитивных семантизациях (несмотря на прослеживающуюся в современных словарях тенденцию в кодифицированных толкованиях указывать на парность частей тела: например, *рука* – «каждая из двух... одна из двух ... конечностей») носитель языка указывает на парность только скрыто, при характеристике через субординату (*бок* – *левый* и *правый*, *губа*, *челюсть* – *верхняя* и *нижняя*), т.е. собственно числовая маркированность оказывается для информанта незначимой. В китайских семантизациях, напротив, достаточно устойчиво при характеристике соматизмов проявляется числовая фиксированность.

Все особенности результатов китайского эксперимента с большей или меньшей достоверностью могут объясняться свойствами китайской лексико-семантической системы, в частности, большей абстрактностью значения китайского существительного, отмечаемой многими китайцами, что предполагает большую степень конкретизации в толковании, в том числе и числовой.

Алтайские семантизации во многом сходны с китайскими: наблюдается использование различных категориальных признаков при толковании, горизонтальная пространственная интерпретация, отчужденность от носителя (часть тела – *человеческая, мужская*), акцентирование парности, несмотря на форму единственного числа стимула.

Принципиальным отличием алтайских семантизаций от русских и китайских является слабая выраженность партитивных отношений (доминирующих в русских реакциях, частотных в китайских): идентифицирующий признак *часть* – *болук* (в китайском – *bù, bùfen*) нередко заменяется словами-категоризаторами *жер, яны* («пространство»), *орган* («функция»), *тук, эт* («структура»), или опускается вовсе (*стопа* – «буттың эң алды» – «ноги самый низ», *макушка* – «баштың эң үсти» – «головы самый верх»).

Однако эти результаты являются в большей степени предварительными. Особый интерес алтайская интуитивная семантизация представляет еще и в силу отсутствия традиции кодифицированных толкований, т.е. на примере алтайских семантизаций можно наблюдать спонтанные семантические процессы практически вне факторов научного метаязыкового влияния.

РАСПРЕДЕЛЕНИЕ ПРОСТРАНСТВЕННОГО ВНИМАНИЯ ПРИ СЛЕЖЕНИИ И ИГНОРИРОВАНИИ ДВИЖУЩЕГОСЯ ОБЪЕКТА

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Существует множество исследований, с той или иной стороны рассматривающих процесс распределения внимания в пространстве. Наше исследование также касается этой проблемы, а точнее, одного из ее аспектов – распределение пространственного внимания в условиях восприятия движения.

Основой настоящего исследования послужили две работы со сходными методиками,

но противоречивыми результатами – П. ван Донкелара и Э. Дрю (van Donkelaar & Drew, 2002) и И. С. Уточкина (Utochkin, 2009). В обеих работах исследовалось время реакции на зондовые стимулы, появляющиеся в разных местах пространства относительно движущегося объекта. В своей работе ван Донкелар и Дрю установили, что обнаружение зонда проходит быстрее, если он появляется позади или впереди движущегося объекта, т.е. на траектории его движения (van Donkelaar & Drew, 2002). Для авторов предвосхищающее распределение внимания вперед является свидетельством в

пользу т.н. *премоторной теории внимания*, рассматривающей пространственные сдвиги внимания в качестве «предвестника» движений глаз. Кроме того, премоторная теория указывает на общность мозговых нейронных сетей, управляющих вниманием и глазодвигательной системой (Rizzolatti et al., 1987). Напротив, Уточкин, рассматривая решение схожей задачи, обнаружил ускорение ответа только на зонд позади движущегося объекта и не нашел признаков ускорения впереди. Несмотря на сходство в стимуляции в двух экспериментах, существует принципиальная разница в инструкциях к ним. Так, в экспериментах ван Донкелара и Дрю движущийся объект выступал как объект внимания (поскольку испытуемые должны были следить за ним глазами), а в эксперименте Уточкина – как игнорируемый объект. В обсуждении результатов своего эксперимента Уточкин указывает на разницу в установках как возможную причину различий в результатах (Utochkin, 2009).

В нашем исследовании мы попытались напрямую проверить *гипотезу* о роли внимания к движению в распределении пространственного внимания. Согласно этой гипотезе, при внимательном слежении за движущимся объектом мы ожидаем ускорения ответа на зондовый стимул как позади, так и впереди данного объекта. Напротив, при игнорировании движущегося объекта мы ожидаем ускорения ответа позади (по принципу непроизвольного *захвата внимания*), но не впереди данного объекта.

Для проверки данной гипотезы мы использовали методику, сходную с методикой из эксперимента Уточкина (2009). Испытуемые смотрели на однородное черное поле и должны были нажать на кнопку всякий раз, когда на экране появлялся зондовый стимул – маленькая серая звездочка (размером 1° , время экспозиции 100 мс). Звездочка появлялась либо на абсолютно пустом экране (*контрольное* условие), либо в присутствии яркого движущегося прямолинейно объекта (белый круг, 2°). Расположение звездочки относительно движущегося круга задавало три экспериментальных условия: «*позади*», «*впереди*» и «*в стороне*». Одно контрольное и три экспериментальных условия задавали фактор «Тип пробы». Кроме того, половина испытуемых получала инструкцию внимательно следить глазами за движущимся кругом, а вторая – стараться его игнорировать во избежание отвлечения от задачи обнаружения зонда (фактор «Инструкция»). Зависимой переменной было время реакции (ВР) на зондовый стимул.

В исследовании приняли участие 50 испытуемых (28 женщин, средний возраст 20,3 года),

имеющие нормальное или скорректированное до нормального зрение.

В результате проверки полученных распределений ВР на значимость различий было обнаружено следующее. Главный эффект фактора «Тип пробы» оказался значим: ($F(3,42) = 108,97$, $p < 0,001$). Эффект обеспечивается значимыми различиями между контрольным и всеми остальными условиями, а также отличием условия «*позади*» от условий «*впереди*» и «*в стороне*»; максимальное время реакции обнаруживается в контрольных пробах, самые быстрые ответы испытуемым удаются в пробах позади. Этот результат в целом соответствует результату, полученному в исследовании Уточкина (2009). Главный эффект фактора «Инструкция» также оказался значимым ($F(1,44) = 10,25$, $p < 0,001$). Эффект обеспечивается тем, что испытуемые, которые выполняли задачу слежения, показывали систематически более долгие реакции, чем испытуемые, которые игнорировали движущийся объект. Вне зависимости от типа пробы, испытуемые из «следающей» группы тратили на обнаружение целевого стимула на 30–35 мс больше, чем испытуемые из «игнорирующей» группы. Эффект межфакторного взаимодействия оказался не значимым.

Результат эксперимента в целом воспроизвел результаты, ранее полученные Уточкиным (2009). Так, в обеих группах испытуемых было обнаружено ускорение ответа на зонд позади движущегося объекта, что можно приписать непроизвольному *захвату внимания* (*attentional capture*). Примечательно, что инструкция на слежение или игнорирование никак не повлияла на распределение внимания на зондовые стимулы впереди движущегося объекта. Основная гипотеза эксперимента, таким образом, не нашла своего подтверждения.

Можно было бы предположить, что испытуемые из «следающей» группы могли недостаточно аккуратно следовать инструкции следить за движением. Однако тот факт, что они систематически давали ответы на зондовый стимул медленнее, чем «игнорирующие» испытуемые, указывает на паттерн *распределенного внимания*. Таким образом, движущийся объект, скорее всего, все же находился в поле внимания испытуемых «следающей» группы, в отличие от «игнорировавшей» группы, которая была сфокусирована преимущественно на зонде.

Таким образом, внимание или игнорирование движущегося объекта сами по себе, похоже, не выступают в качестве условий, объясняющих различия в паттернах пространственного распределения внимания. Вместе с тем, результаты

настоящего исследования не позволяют в полной мере осуществить диссоциацию между скрытым вниманием к движущемуся объекту (перемещением внимания без движений глаз) и явной ориентировкой внимания, сопровождаемой плавным слежением. Возможно, именно характер движений глаз *per se* влияет на паттерн распределения внимания. Более строгий экспериментальный контроль с помощью регистрации движений глаз позволит в будущем получить более определенный ответ на этот вопрос.

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ЭЛЕКТРОЭНЦЕФАЛОГРАФИЧЕСКИЕ КОРРЕЛЯТЫ КОГНИТИВНЫХ СПОСОБНОСТЕЙ В ГРУППЕ ДЕТЕЙ С ПСИХИЧЕСКИМИ ЗАБОЛЕВАНИЯМИ

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Нахождение биологических механизмов, обеспечивающих протекание высших психических функций в норме и патологии, является актуальной проблемой на сегодняшний день. В психофизиологии существует два независимых подхода к изучению ВПФ [1]. В основе первого подхода лежит регистрация физиологических показателей в процессе выполнения различного типа задач. На основании проведенных исследований в рамках данного подхода было установлено, что при мыслительной деятельности происходит перестройка частотно-амплитудных параметров ЭЭГ, охватывающая все основные ритмические диапазоны – от дельта до гаммы. В основе второго подхода лежит сопоставление индивидуально-специфических устойчивых физиологических и психологических показателей. Одним из наиболее интенсивно изучаемых направлений является изучение соотношения характеристик функциональной активности головного мозга с оценками интеллекта. Однако существующие данные о взаимосвязях различий в интеллекте со спектральными характеристиками ЭЭГ противоречивы. Одни авторы не выявляют никакой связи между спектральной мощностью ЭЭГ и оценками интеллекта, другие обнаруживают взаимосвязи между показателями интеллекта и мощностью альфа- и тета-ритмов в нормативной выборке [2]. Также существуют исследования, посвященные изучению взаимосвязи психических показателей с электроэнцефалографическими параметрами при различных

вариантах дизонтогенеза. Так, в исследовании А. А. Коваль-Зайцева было установлено, что у детей с аутистическими расстройствами уровень бета-активности коррелирует, в основном, с интеллектуальными нарушениями и степенью выраженности аутистических расстройств [3]. В проведенном нами раннее исследовании были обнаружены положительные корреляции выраженности поведенческих расстройств с индексом тета- (в основном, частотой 6–7 Гц) и бета2-активности и отрицательные корреляции с индексом альфа-активности в группе детей с ФРАХА [4].

Наша работа посвящена исследованию корреляций между оценками когнитивных способностей и параметрами ЭЭГ в группах детей с наследственными психическими заболеваниями, которые сопровождаются выраженными когнитивными нарушениями: синдромом умственной отсталости, сцепленной с ломкой хромосомой X (ФРАХА), и ранней детской шизофренией. Группы были уравнены по уровню интеллектуального развития (невербальный индекс = 50–60 ед.). В работе были использованы тест интеллекта КАВС–II (были выбраны задания невербальной шкалы) и метод количественного анализа ЭЭГ (метод ЭЭГ-картирования). Для поиска взаимосвязи между параметрами ЭЭГ и показателями выполнения психологических тестов использовался корреляционный анализ (коэффициент корреляции Пирсона).

Результаты и обсуждение.

1. При исследовании корреляции данных ЭЭГ-картирования с показателями отдельных субтестов КАВС–II у больных с ФРАХА и больных шизофренией с тем же уровнем интеллектуального развития были получены умеренно высокие корреляции с показателями

выполнения тестов, которые входят в оценку симультанной обработки информации (субтесты «Треугольники», «Завершение гештальта», «Узнавание лиц»). По словам авторов теста, шкала симультанной обработки информации в большей мере связана со способностью ребенка решать новые задачи и формировать новые абстрактные понятия, то есть стоит ближе к интеллекту.

2. Несмотря на выявленное сходство, при проведении корреляционного анализа были установлены и отчетливые различия, что, очевидно, связано с различными патологическими механизмами, вовлеченными в развитие данных заболеваний.

Дети с ФРАХА, у которых в ЭЭГ была меньше представлена тета-активность в полосе 6–7 Гц в теменных зонах коры и больше представлена диффузная альфа-3 и бета-1 активность, лучше справлялись с субтестом «Треугольники». У детей с детской шизофренией корреляции были иные. Лучше справлялись с тестом те больные шизофренией, у которых был меньше представлен компонент 4–5 Гц в затылочных отведениях и больше выражена диффузная активность альфа-1 полосы частот. Еще больше эта тенденция проявилась в субтесте «Завершение гештальта». Лучшее выполнение этого теста у пациентов с

ФРАХА наблюдалось при меньших значениях спектральной плотности в теменных зонах коры в полосе 6–7 Гц и больших в альфа-3 полосе частот, тогда как у больных шизофренией были отмечены положительные корреляции исключительно в полосе частот 8–10 Гц.

Таким образом, на основании полученных данных спектрально-корреляционного анализа ЭЭГ с показателями тестирования когнитивных способностей у детей с психическими заболеваниями можно сделать вывод, что в основе нарушения когнитивных процессов при разных вариантах дизонтогенеза лежат различные нейрофизиологические механизмы.

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МОДЕЛИРОВАНИЕ КОГНИТИВНЫХ МЕХАНИЗМОВ В УСЛОВИЯХ СИТУАЦИИ ОБМАНУТОГО ОЖИДАНИЯ

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Эффект обманутого ожидания как проблема реакции индивида на воспринимаемый объект носит междисциплинарный характер и затрагивается в самых различных отраслях знания, от философии до кибернетики, изучающей язык как разновидность вероятностного процесса.

В когнитивной психологии экспектации (ожидания) обычно трактуются в терминах прогнозирования, то есть эффект обманутого ожидания связан с осуществлением наименее прогнозируемого исхода ситуации. Характер ожиданий зависит от влияния эффектов имплицитной памяти на построение когнитивных репрезентаций. В их число входит прайминг-эффект, или эффект предшествования, который трактуется как непрямая оценка влияния прошлого опыта на успешность проведения тех или иных операций (Величковский 2006).

Так, при изучении механизмов речепроизводства и речевосприятия можно наблюдать, что репрезентации текста, сконструированные реципиентами при понимании предыдущих отрывков текста, оказывают непосредственное влияние на восприятие последующих событий. Несовпадение сконструированной реципиентом контрситуации и оригинальной ситуации-развязки провоцирует эффект обманутого ожидания, влекущий за собой дальнейший пересмотр ситуации.

Возможность вероятностного прогнозирования основывается на припоминании типичных фиксированных сценарных схем и обеспечивается соотношением языковой информации текста со схемами наличных знаний и убеждений, образующих ряд ассоциирующихся внутренних контекстов. В работах Залевская 2005, Сазонова 2000 подчеркивается роль внутреннего когнитивного контекста интерпретации, влияющего на процессы кодирования, хранения и извлечения информации.

В связи со стремлением ученых к углубленному пониманию познавательной деятельности человека проблема переработки лексики приобретает все большую актуальность. Обеспечивая ассоциативную связь с перцептами и концептами, слово активизирует сложнейшие структуры человеческого мозга и индуцирует «целые пакеты гетерохронной и гетерогенной информации» (Кубрякова 2004: 388). В связи с тем, что концептуальные системы разнятся не только от носителя одной культуры к носителю другой культурной общности, но и от одного индивида к другому, в процессе общения нередко возникают некоторые когнитивные сбои, в частности, обсуждаемый нами эффект обманутого ожидания.

В 2009 году нами было проведено экспериментальное исследование, направленное на изучение механизмов восприятия речи, служащих причиной возникновения эффекта обманутого ожидания [Умеренкова 2009]. На примере ситуации обманутого ожидания мы попытались проследить, каким образом и в какой степени особенности организации ментального лексикона человека, его когнитивный опыт влияют на восприятие речевого сообщения конкретным индивидом.

При восприятии и дополнении ситуаций, состоящих из двух предложений (*Собака увидела кость в мусорном ведре. В предвкушении обеда она завиляла хвостом*), собственным третьим предложением, испытуемые оперировали концептами, которые в ходе эксперимента образовывали определенные классы. Природа взаимодействия элементов такого мыслительного процесса соотносится с теорией «ментальных пространств» («Mental Spaces») Ж. Фоконы и ее дальнейшим развитием, получившим название теории «концептуальной интеграции» («Conceptual Blending») Ж. Фоконы и М. Тернера, которые и легли в основу нашего анализа (Fauconnier, Turner 2002). В нашем случае ментальные пространства представляют собой пространства ожидания воспринимающего речь субъекта относительно наиболее типичного развития сценария.

На рисунке темно-серым цветом обозначены зоны интеграции пространств ожидания; светло-серым – наиболее типичные ожидания по поводу исхода ситуации; белым – менее типичные ожидания.

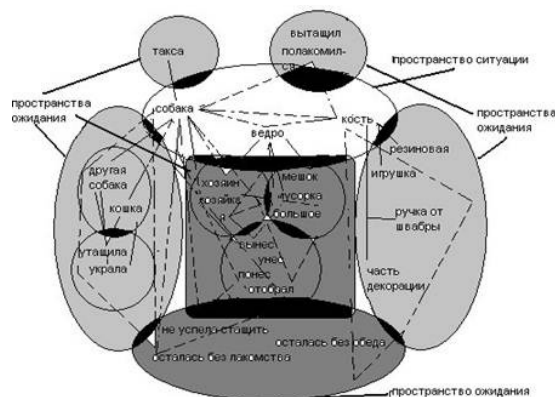


Рис.1. Модель восприятия ситуации «Собака»

Сконструированные нами модели фиксируют сложный разноплановый процесс формирования ожиданий, подразумевающий определенный механизм: информация на входе соотносится со схемой индивидуальных знаний, полученных из предшествующего опыта; категоризируется и направляется согласно устройству ассоциативных связей данного конкретного реципиента – все это определяет характер формирующихся ожиданий, которые, в свою очередь, напрямую влияют на особенности построения встречного речевого высказывания. Процесс восприятия представляет собой формирование встречного речевого высказывания, так как в обоих процессах задействуются подобные единицы (ассоциации, эмоции, оценка, представление и др.), что позволяет говорить о возможности создания интегративной модели, одновременно иллюстрирующей основные этапы протекания механизмов как производства, так и восприятия речевого сообщения.

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О НЕПОСЛЕДОВАТЕЛЬНОМ ПРОЦЕССЕ ПРИНЯТИЯ ЛЕКСИЧЕСКОГО РЕШЕНИЯ

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Исследования процесса визуального распознавания слов (visual word recognition) имеют давнюю историю. Первоначальные работы рассматривали аспекты двойного орфографического и фонетического кодирования, роли букв и фонем в принятии решения (Rubin, Becker & Freeman 1979). Ситуация существенно изменилась в 1975 году, когда вышла работа Ч. Тафта, в которой предлагалась совершенно новая декомпозиционно-морфологическая модель принятия лексического решения (в психолингвистических исследованиях задача лексического решения характерна для работ, посвященных визуальному распознаванию слов, являясь одновременно и экспериментальной парадигмой, и результатом распознавания). В настоящее время распространено представление о том, что факторами принятия лексического решения могут быть орфографические, морфологические и семантические характеристики буквосочетания (Rastle, Davis 2004).

Большая часть работ по визуальному распознаванию слов исходит из принципа, что процесс принятия лексического решения последователен – модель декомпозиции предполагает вычленение морфемы и поиск в ментальном лексиконе основания (если есть – принимается решение о том, что «слово», если нет – анализ по целому буквосочетанию), идеи семантической прозрачности лишь уточняют эту модель и ориентированы на определение доминирующего принципа декомпозиции слова – морфологического или семантического (на основе экспериментов с использованием праймов).

Нам представляется интересным рассмотреть вариант, когда лексическое решение принимается не в последовательной проверке признаков и выводе в результате решения, а обратным образом – путем подтверждения базовой общей гипотезы о том, что буквосочетание имеет значение (является словом). Для этого мы провели два эксперимента с использованием нескольких групп сложных стимулов, с точки зрения декомпозиционной модели, равнозначных (не имеющих аффиксов).

Эксперимент 1. Метод: стимульные буквосочетания в случайном порядке предъявляются на 50 мс, перед каждым предъявлением вводится фиксирующая точка (500 мс). После

предъявления стимульного буквосочетания следует маска (200 мс), и предлагается сделать выбор, является ли предъявленное буквосочетание словом. Формат предъявления – на экране монитора, решение фиксируется как нажатие кнопки «вправо» или «влево». Время на решение не ограничено. После выбора испытуемого демонстрируется белое поле-дистрактор (500 мс).

Стимулы. 20 семибуквенных словосочетаний, из которых 10 – простые слова («тетерев»), 10 – сложные слова (не имеют префиксов, четыре, находящиеся не с краю, буквы которых образуют отдельное, «включенное слово»: «эстонец»). Стимульные слова проверены по словарю частотности Шарова и Ляшевской, *ipm* индекс не превышает 4.

Гипотеза: «включенные слова» влияют на скорость принятия лексического решения. Испытуемые: 58 мужчин и женщин в возрасте 19–25 лет.

Результаты: Согласно результатам сравнения групп по критерию Манна-Уитни, респонденты значимо быстрее принимают решение по «сложным» словам (1223 мс, $N=552$, $SD=1344$), чем по простым словам (1395 мс, $N=555$, $SD=1135$), при $p=0,005$ и d -Коэна=0,14. Таким образом, мы сталкиваемся с определенным противоречием декомпозиционной модели – «включенное слово», которое никак не вычленишь из целого буквосочетания (нет морфологических или семантических оснований), значимо сокращает время принятия лексического решения. Притом, этот результат можно объяснить только в том случае, если принять, что буквосочетание обрабатывается в виде образа, а не в процессе чтения справа налево, так как буквы «включенного слова» являются центральными буквами стильного буквосочетания.

Эксперимент 2. Метод идентичен методу проведения первого эксперимента.

Стимульные материалы: 28 пятибуквенных буквосочетаний, из которых 10 – простые слова («кочан»); 10 – слова, из букв которых можно составить еще одно слово (треск и крест), 8 – слова, из букв которых можно составить два самостоятельных слова (пятка, пятак, тяпка).

Гипотеза: по словам, из букв которых можно составить другое слово, лексическое решение будет приниматься медленнее, чем по простым словам. Испытуемые: 54 мужчин и женщин в возрасте 19–25 лет.

Таблица 1. Множественные сравнения

Зависимая переменная: время принятия решения

(I) слово и варианты	J) слово и варианты	Разность средних (I-J)	Стд. Ошибка	Знач.
слово+0	слово+1	139,9*	22,2	,001
	слово+2	165,9*	23,5	,001
слово+1	слово+0	-139,9*	22,2	,001
	слово+2	25,9	23,1	,263
слово+2	слово+0	-165,9*	23,5	,001
	слово+1	-25,9	23,1	,263

* Разность средних значима на уровне 0.05.

Результаты: При проведении дисперсионного анализа становится понятно, что гипотеза, в целом, подтверждается – группы значимо различаются ($df=2$; $F=30,21$; $p=0,001$). Результаты множественного сравнения групп по критерию LSD можно увидеть в Таблице 1:

Итак, мы видим, что по простому слову (слово+0) значимо медленнее принимается решение (956 мс, $N=494$, $SD=427$), чем по словам, из букв которых можно сложить одно слово (816 мс, $N=529$, $SD=324$), при $p=0,01$ и $d\text{-Коэна}=0,37$. Слова, из букв которых можно сложить два отдельных слова (слово+2), также распознаются быстрее, однако различия со второй группой слов (из букв которых можно сложить только одно слово) незначимы ($p=0,263$, 790 мс, $N=422$, $SD=295$). Однако показатели размера эффекта ($d\text{-Коэна}=0,08$) позволяют предполагать, что незначимость этого различия ситуативна и может быть опровергнута при повторных экспериментах. Эти результаты в определенной мере подтверждают нашу идею о том, что при лексическом решении проверяется гипотеза

«буквосочетание является словом», а не определяется по совпадению стимула или его части с хранимым элементом в ментальном лексиконе. Основанием для этого является подсчет шансов – две осмысленные комбинации букв, которые перебираются при решении, увеличивают вероятность принятия решения «слово», по сравнению с одной комбинацией.

Подытоживая результаты двух экспериментов, мы считаем необходимым пересмотр декомпозиционной модели принятия лексического решения как последовательного вывода решения о том, является ли буквосочетание словом или нет, и более детальное рассмотрение коннекционистской модели с позиции проверки и подтверждения общей гипотезы о том, что буквосочетание является словом.

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УРОВНИ КОГЕРЕНТНОСТИ ЭЭГ ПРИ МЫСЛЕННОМ ВОСПРОИЗВЕДЕНИИ МУЗЫКАЛЬНЫХ МЕЛОДИЙ

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Данное исследование направлено на выявление факторов воздействия музыкальных средств на слушателя. В ходе эволюции систем музыкального мышления эмпирическим путем складывались различные комплексы музыкальных средств, часть которых отсеивалась, а часть получала дальнейшее развитие и применение. Мы предполагаем, что существуют общие

нейрофизиологические закономерности восприятия и усвоения музыкальных средств, которые претерпевают коррекцию вместе со сменами музыкальных направлений.

Целью исследования является анализ общих закономерностей и индивидуальных особенностей реагирования мозга человека на применение различных музыкальных средств, выявление объективных закономерностей воздействия музыкальных средств на мозговую активность.

Междисциплинарное исследование на стыке музыкального анализа и психофизиологии представляется новым и перспективным шагом в развитии музыкальной теории. Применение нового метода музыкального анализа на основе

объективных научных данных даст дополнительный стимул для развития прикладной музыки (киномузыки, музыки для театра, рекламы и т.д.).

Гипотеза исследования:

При восприятии музыки в головном мозге формируются функциональные связи между нейронами. Повторение музыкальных структур способствует закреплению этих связей. Функциональные связи не формируются, если при восприятии музыки не происходит выделения музыкальных структур.

Гипотеза эксперимента:

Если при выделении структуры музыки в процессе ее восприятия происходит формирование функциональных связей между нейронами головного мозга, то при воспоминании музыки (мысленном воспроизведении музыкальной структуры) будет происходить активация этих связей.

Данную гипотезу можно проверить современными методами анализа электроэнцефалограммы, в частности, путем вычисления когерентных связей.

Когерентность – это инструмент анализа процессов, связывающих различные области мозга. Когерентность между ЭЭГ сигналами, записанными одновременно от пары разных электродов, обеспечивает измерение динамической связи между различными областями мозга.

Методика эксперимента:

В качестве стимулов для эксперимента были отобраны отрывки из 3 классических музыкальных произведений (С. Рахманинов, Р. Вагнер, И.– С. Бах), 3 сочинений авангардного направления (Берио, Веберн, Пуссёр) и 3 современных популярных композиций (Aha; Metallica; 50 cent) продолжительностью от 1 мин 45 сек до 3 мин 10 сек. Музыкальные отрывки отобраны и сгруппированы по критерию использования в них разных типов музыкальных средств. При предъявлении мелодии чередовались в случайном порядке. Записи музыкальных отрывков предъявляли через звуковые колонки, в свободном акустическом поле.

Задачей испытуемых было прослушать музыкальный отрывок, стараясь запомнить его, и мысленно воспроизвести музыку после прослушивания, а также оценить мелодию по 2 параметрам: ее приблизительная длительность и субъективная привлекательность.

В процессе эксперимента проводили запись фоновой ЭЭГ (4 мин), запись ЭЭГ при прослушивании музыки с закрытыми глазами, запись ЭЭГ во время воспоминания музыки (1,5 мин). Перед началом исследования испытуемый

получал инструкции, после прослушивания и воспоминания оценивал мелодию. Такая последовательность процедур повторялась для каждого музыкального отрывка.

ЭЭГ регистрировали от 16 отведений. Электроды располагали по международной схеме 10–20%, монополярно с объединенным ушным электродом. Для записи ЭЭГ использовали 21-канальный усилитель фирмы «Статокин» (Москва). Для анализа результатов использовали программы фирмы «Статокин».

Обработка данных состояла в расчете спектров мощности ЭЭГ в полосе от 0,5 до 45 Гц (в шести стандартных диапазонах частот: дельта 0,5–4 Гц, тета 4–8 Гц, альфа 8–13 Гц, бета1 13–20 Гц, бета2 20–30 Гц, гамма 30–45 Гц) и усреднении полученных величин для каждого испытуемого и затем отдельно для каждой из выделенных групп. Различия когерентности вычислялась по нормализованным показателям с помощью *t*-критерия Стьюдента. Различия рассматриваются как значимые при значениях $p < 0.05$.

В исследовании приняли участие 20 испытуемых в возрасте 18–35 лет, среди которых были 10 профессиональных музыкантов (дирижеры, вокалисты, исполнители), и 10 испытуемых без систематического музыкального образования и не занимающихся профессиональной музыкальной деятельностью («обычные слушатели»).

Результаты:

Сопоставление ЭЭГ у двух групп испытуемых – «музыкантов» и «обычных слушателей» – выявило статистически значимые различия когерентности при мысленном воспроизведении музыки по сравнению с фоном, а также межгрупповые различия при воспоминании музыкальных отрывков разного типа. Получены статистически значимые различия когерентности при мысленном воспроизведении отрывков из популярной музыки по сравнению с фоном как в группе музыкантов, так и у обычных слушателей. Значимые различия обнаружены в дельта- и гамма-диапазонах между отведениями в затылочной и теменной областях. При мысленном воспроизведении отрывков из классической музыки по сравнению с фоном значимых различий когерентности не выявлено, однако при более подробном рассмотрении оказалось, что неправомерно объединение отрывков из музыки разных композиторов в одну группу. При мысленном воспроизведении музыки Вагнера выявлено статистически значимое увеличение когерентности по сравнению с фоном в ряде отведений ЭЭГ музыкантов. Сопоставление значений когерентности при мысленном

воспроизведении современной авангардной музыки по сравнению с фоном обнаруживает более высокие значения когерентности в гамма-, бета2- и альфа-диапазонах между отведениями в височных и затылочных областях. Однако в ряде отведений центральной и затылочной областей в альфа и бета-1 диапазонах значения когерентности в фоне были значимо выше, чем при воспоминании авангардной музыки. Значимые различия когерентности ЭЭГ при мысленном воспроизведении современной авангардной

музыки были обнаружены только у профессиональных музыкантов.

Таким образом, анализ когерентности ЭЭГ при мысленном воспроизведении музыкальных мелодий может служить инструментом исследования музыкального восприятия. Статистически значимое увеличение когерентности ЭЭГ при мысленном воспроизведении мелодий по сравнению с фоном в альфа- и гамма-диапазонах может свидетельствовать об активации когнитивных процессов.

ТЕОРИЯ ЗРИТЕЛЬНОГО ПОИСКА, ОСНОВАННАЯ НА СТАТИСТИЧЕСКОМ АНАЛИЗЕ МНОЖЕСТВ ОБЪЕКТОВ

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Задача зрительного поиска в последние три десятилетия стала одной из ведущих парадигм исследования механизмов зрительного внимания. Наиболее влиятельные модели пытаются объяснить ряд ярких феноменов зрительного поиска через взаимодействие двух последовательных стадий – параллельной стадии предвнимательной обработки и последовательной стадии внимательной обработки. Соглашаясь в правомерности разделения разных стадий, разные теоретики приписывают им разное соотношение функций. Например, предвнимание отображает элементарные признаки на пространственных картах, а внимание связывает их в единый образ (Treisman, Gelade, 1980). Кроме того, предвнимание, вероятно, участвует в разбиении объектов на релевантные и нерелевантные подмножества, сокращая перебор объектов на стадии внимания (Wolfe, 1994).

В предлагаемой нами модели рассматривается еще один возможный тип взаимодействия предвнимания и внимания в зрительном поиске. Он основан на идее о том, что предвнимание способно производить определенные статистические расчеты над множествами (Ariely, 2001) и подмножествами (Chong, Treisman, 2005) объектов. Если такие расчеты могут действительно осуществляться, то системе предвнимания должна быть доступна информация о средних значениях тех или иных признаков объектов и вероятности, с которыми они появляются в зрительной сцене. С формальной точки зрения, этой информации достаточно для расчета уровня информационной *энтропии* (неопределенности, вариативности) зрительной сцены. Средняя

энтропия элемента зрительной сцены может быть вычислена по формуле Шеннона (1948): $H = -(p_1 \log p_1 + p_2 \log p_2 + \dots + p_i \log p_i)$, где p_1, p_2, \dots, p_i – вероятности появления 1, 2, ..., i -го элемента в зрительном наборе. Согласно теории Шеннона, чем меньше уровень информационной энтропии, тем больше информации может быть передано без потерь в единицу времени через канал с ограниченной пропускной способностью. Если под каналом с ограниченной пропускной способностью понимать систему внимания, то для зрительного поиска это утверждение может быть сформулировано следующим образом: чем ниже уровень энтропии набора, тем более широким может быть «окно» внимания при обработке объектов. Приведем эмпирические доказательства этого тезиса.

Поиск признаков vs. поиск соединений. Согласно классическим данным, поиск уникального объекта среди других, отличающихся только по одному признаку, осуществляется мгновенно и не зависит от количества объектов (т.н. *параллельный поиск*, феноменально переживаемый как «выскакивание» цели – рис. 1а). Поиск такого же уникального объекта среди объектов, разделяющих с ним хотя бы один из признаков, обычно осуществляется дольше, и его время пропорционально количеству объектов (*последовательный поиск*) (рис. 1б). Подсчитаем вероятности появления отдельных объектов на рис. 1а и 1б (на обоих по 10 объектов). На рис. 1а вероятность черной линии равна 0,1, белой – 0,9. На рис. 1б вероятность черной вертикальной линии равна 0,1, черной горизонтальной – 0,4, белой вертикальной – 0,5. Подставив эти значения в формулу Шеннона, получаем, что для рис. 1а $H = 0,47$ бит, для рис. 1б $H = 1,36$ бит. Предположим далее, что самое жесткое ограничение на объем внимания

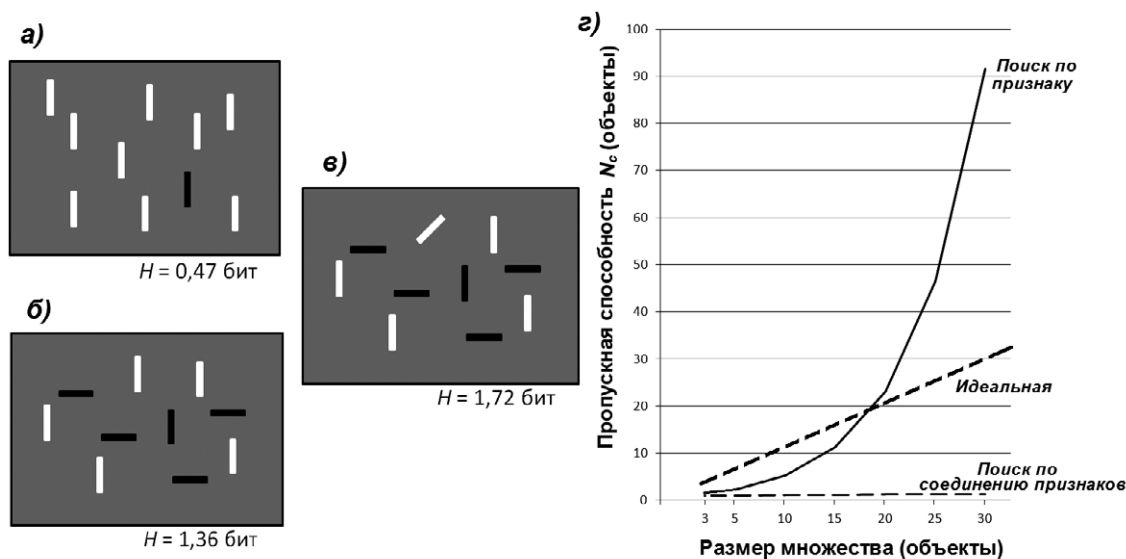


Рис. 1. Зрительный поиск: а) по признаку; б) по соединению признаков; в) по соединению признаков с уникальным объектом; г) пропускная способность поиска (в единицах объектов) для признаков и соединений при разных размерах множества.

(пропускную способность) равно одному объекту за раз, и это ограничение соблюдается при максимальном уровне энтропии (что соответствует набору из 3 уникальных объектов с комбинацией из двух признаков – ориентации и цвета, $H=1,58$ бит). Если принять эту величину за единицу пропускной способности, то пропускную способность (в количестве объектов) для любого набора можно вычислить как $N_c = 2^{1,58/H}/2$, где H – уровень энтропии данного набора. На рис. 1г показан график прироста пропускной способности для задачи поиска одного признака и поиска по сочетанию двух признаков. Как видно из рисунка, пропускная способность для признака либо превышает, либо немного отстает от действительного размера множества, что соответствует параллельному поиску, а пропускная способность для сочетания практически никогда не превышает 1–1,5 объектов, что соответствует последовательному поиску.

Непроизвольный захват внимания уникальным объектом. Данный феномен заключается в замедлении поиска объекта в присутствии одного объекта с уникальным набором характеристик (рис. 1в). Поскольку данный объект вносит свой вклад в энтропию, пропускная способность «окна» внимания также будет уменьшаться. Так, если для рис. 1б $H=1,36$ бит, то для рис. 1в $H=1,72$ бит, и это означает, что за

единицу времени «окно» внимания охватит 1,2 раза меньше объектов на рис. 1в, чем на рис. 1б.

Таким образом, в рассматриваемой модели предвидение предстает в роли механизма, обеспечивающего расчет энтропии и последующего *восходящего* контроля ширины «окна» внимания. Окончательная же обработка (включающая осознание) объектов, будь то параллельный или последовательный поиск, остается прерогативой внимания, что соотносится с рядом современных представлений (Nakayama, Martini, 2011).

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АКТИВАЦИЯ СИСТЕМ «ЗЕРКАЛЬНЫХ» НЕЙРОНОВ ЧЕЛОВЕКА ПРИ ПРЕДСТАВЛЕНИИ ДЕЙСТВИЙ В ЗАВИСИМОСТИ ОТ НАЛИЧИЯ ИЛИ ОТСУТСТВИЯ ОПЫТА ИХ ВЫПОЛНЕНИЯ

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Впервые зеркальные нейроны были описаны итальянскими нейрофизиологами Джакомо Ричиоллатти, Витторио Галлезе и Леонардо Фогасси из университета города Парма. В зоне F5 головного мозга макак при микроэлектродных исследованиях были выявлены нейроны, которые отвечают усилением импульсной активности как при самостоятельном хватании изюма, так и в случае, если обезьяне демонстрируют такое хватание экспериментатором или другим животным. Вопрос о «зеркальных» нейронах до сих пор дискутируется. Ряд специалистов строго ограничивает функциональные возможности зеркальных нейронов, считая, что они связаны с целью движений. В других случаях понятие «зеркальные» нейроны расширяется на функции подражания, эмпатии (сопереживания), понимание сознания другого (theory of mind), речи.

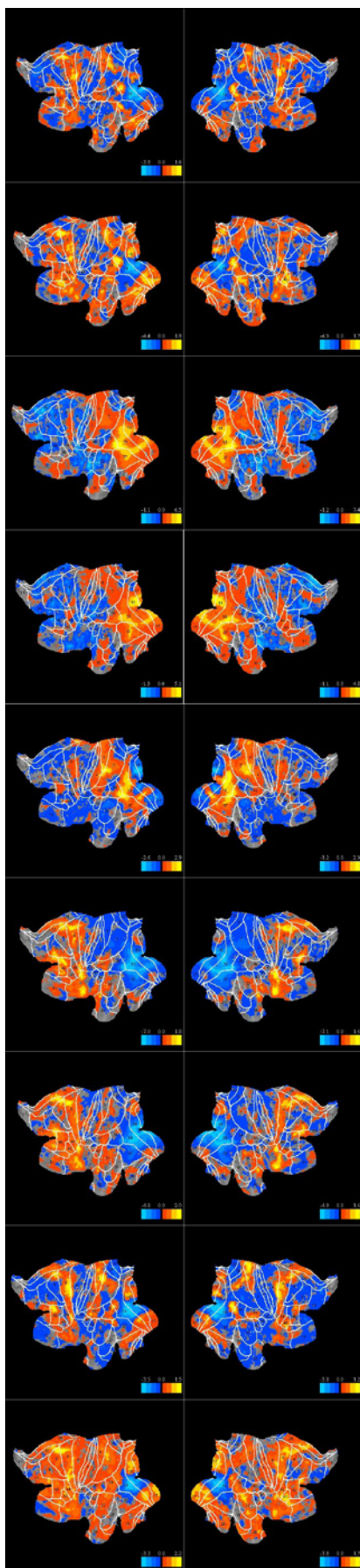
Цель работы – локализация и функциональный анализ структур головного мозга, включающие системы «зеркальных» нейронов и дающие значимый гемодинамический ответ (фМРТ) во время демонстрации и представления себя в качестве участника, выполняющего показанные действия, с учетом наличия или отсутствия опыта выполнения этих действий.

В эксперименте принимали участие 21 здоровый доброволец – 13 мужчин и 8 женщин в возрасте 20–38 лет (средний возраст 23 года). Все испытуемые дали свое согласие на участие в экспериментах и были опрошены на наличие опыта прыжка с парашютом и чтения лекции: все испытуемые имели опыт проведения или присутствия на лекции, только один имел также опыт прыжка с парашютом. Каждому испытуемому было представлено 9 блоковых парадигм, каждая из которых длилась 3 мин и состояла из 3 блоков. Каждый блок состоял из базовой стимуляции (точка фиксации или задача парадигмы)

и задачи парадигмы длительностью по 30 сек. Задачами парадигмы являлись: представление себя на месте участника двух сюжетов, просмотр видео двух сюжетов, немедленное представление после просмотра, отставленное представление данных видеосюжетов. Первый сюжет «Прыжок с парашютом» был необычен для большинства испытуемых – студентов университета в отличие от другого видео – «Лекции в аудитории». Использовали следующие парадигмы: 1) точка фиксации + воображение прыжка, 2) точка фиксации + воображение лекции, 3) точка фиксации + просмотр прыжка, 4) точка фиксации + просмотр лекции, 5) просмотр лекции + просмотр прыжка, 6) просмотр прыжка + припоминание прыжка, 7) просмотр лекции + припоминание лекции, 8) точка фиксации + припоминание прыжка, 9) точка фиксации + припоминание лекции. Для регистрации использовали магнитно-резонансный томограф Philips Achieva с полем сверхпроводящего магнита 3.0 Тл и мощностью градиентной катушки 80 мТл/м. Функциональные данные получали с помощью эхо-планарного протокола (TR=3000 мс, TE=35 мс, матрица 128x128, размер пикселя 1.8x1.8 мм, толщина среза 4 мм, промежуток между срезами 1 мм). В каждой временной серии получается 60 наборов функциональных срезов, покрывающих весь объем головного мозга. Для проведения нормализации и корегистрации использовали индивидуальную изотропную трехмерную модель головного мозга с размером вокселя 1x1x1 мм³, построенную с помощью T1-взвешенных анатомических срезов с размером пикселя 1x1 мм² и толщиной 1 мм.

Индивидуальные данные подвергались нормализации, приводились в единое Тейлерах – пространство (Talairach J. et al., 1988) и усреднялись с применением программы SPM-8. Модель корковой поверхности подвергали пространственным преобразованиям, позволяющим развернуть её на плоскости. Это позволяло создать карты распределения Т-критерия для всех корковых полей правого и левого полушарий мозга. Максимумы значений Т-критерия соответствующим $p < 0.01$.

Полученные данные показывают, что при пассивном восприятии видеосюжетов различия в зонах активации головного мозга между испытуемыми минимально по сравнению с задачами, связанными с представлением себя в качестве



субъекта, выполняющего действия. При пассивном восприятии видеосюжетов и их представлении активируются разные области сенсорной коры, что свидетельствует о возможности создания ментальных моделей зрительных образов при участии префронтальной, сенсорной и теменной коры. В сериях, связанных с представлением себя в качестве субъекта, выполняющего действия – «прыжок с парашютом» и «чтение лекции» соответственно, обнаруживается зависимость величины объема зон гемодинамического ответа от наличия или отсутствия опыта выполнения представляемых действий, при этом эффект носит разнонаправленный характер в зависимости от того, какое было представление: непосредственное или отсроченное (см. Рис. 1). Данные регистрации движений глаз свидетельствуют о высоком сходстве параметров движений глаз и стратегий распределения внимания у разных испытуемых в условиях предъявления динамического экспериментального материала. Относительно более высокая интенсивность частоты смены фиксации в условиях показа сценариев с парашютными прыжками позволяет объяснить отмеченную при данных условиях в данных фМРТ более высокую активацию фронто-париетальной системы контроля и переориентации внимания, в частности, более высокую активацию высшего отдела дорзального потока переработки зрительной информации – области lateral intraparietal area.

Рис.1 Распределение T-критерия ($-2.5 < T < 2.5$) в коре (плоская проекция) левого и правого полушарий по девяти блоковым парадигмам (расположены по порядку предъявлений). Белыми линиями обозначены границы, а цифрами – номера полей по Бродману.

КОГНИТИВНЫЕ МЕХАНИЗМЫ ТВОРЧЕСТВА: ОБЩЕСИСТЕМНЫЙ ВЗГЛЯД

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Со времен А. Пуанкаре в психологии принято описывать творчество как двойственный процесс, полюсами которого являются логика и интуиция или сознание и бессознательное. Такое описание основывается на выделении фаз творческого процесса, в которых поочередно проявляется доминирование то одного, то другого полюса.

От самого А. Пуанкаре идет интерпретация бессознательного (интуитивного) полюса как хаотического взаимодействия идей. А. Пуанкаре использовал для характеристики этих процессов модель газа. Другой полюс – логическое, или сознательное – может быть в этом случае охарактеризован как поведение, направленное на достижение целей.

Интерпретация этой структурной двойственности с функциональной точки зрения возможна с помощью идей, идущих от У. Джемса. У. Джемс высказал предположение, что творчество должно носить «дарвиновский» характер, то есть сочетать необходимость и случайность, направленный отбор и мутации. Действительно, дарвиновские процессы позволяют объяснить процесс появления нового, того, что не было заложено в исходных предпосылках. Такое новое появляется как в биологической эволюции, так и в творчестве.

Идея дарвиновского характера творчества была подхвачена такими крупными психологами, как Боринг и Саймонтон. Так, Д. К. Саймонтон предложил дарвиновскую модель творчества, которая объясняет такие феномены, как кривая зависимости творческих достижений в науке и искусстве от возраста творца, распределение творческих достижений и т. д.

Дарвиновское объяснение распространилось и на когнитивные модели творчества. К. Мартиндейл обобщил представления С. Медника об отдаленных ассоциациях и Дж. Мендельсона о роли дефокусированного внимания и предложил сетевую модель творчества. Согласно К. Мартиндейлу, творчество может быть представлено как периодическое изменение «температуры» сети Хопфилда. Повышение температуры соответствует хаотическим процессам, вызывающим «мутации» идей, в то время как понижение – процессам об разования жестких репрезентативных структур.

Аргументацией в пользу такого подхода является корреляция между творческими способностями (креативностью) и объемом переработки периферийной информации; меньшая степень активации мозга (большая мощность альфа-ритма) у креативов при решении творческих задач; большая способность к переключению между фокусированным и дефокусированным вниманием у креативов и т. д.

Проведенные в нашей лаборатории исследования (Е. А. Валуева, Е. В. Гаврилова), однако, не подкрепляют дарвиновский подход к творчеству. В этих исследованиях, в частности, показано, что в рамках парадигмы уровней переработки информации Ф. Крейка с использованием периферийной информации коррелирует не креативность, а кристаллизованный интеллект.

В этом контексте встает вопрос о принципах работы интуитивного механизма, включенного в творческое мышление. Я. А. Пономарев предполагал, что исходное отражение новых, ранее неизвестных субъекту свойств внешних объектов первично происходит на уровне действия, а уже затем в некоторых случаях может стать доступным сознанию. Отражение на уровне действия означает, что действие может выполняться с учетом тех свойств объектов, о которых на рефлексивном уровне субъект не отдает отчета. Я. А. Пономарев показал феномен фиксации «побочных продуктов» на уровне действия. Близкие явления описал А. Ребер под именем ставшего в последнее время модным имплицитного научения. В рамках имплицитного научения человек оказывается способным к произведению действий с учетом таких особенностей информационного потока, которые он не способен рефлексивно воспроизвести.

В этом контексте представляет интерес введенное поздним Ж. Пиаже понятие рефлексивной абстракции (*abstraction reflexive*), которая состоит в осознании субъектом закономерностей в результате их абстрагирования из собственного действия и была подвергнута эмпирическим исследованиям в Женеве в конце 1980-х гг.

Таким образом, складывается двухстадийная картина: на первой стадии новая информация запечатлевается (вероятно, путем оперантного научения) в структурах действий, внешних и внутренних, а на второй стадии она рефлексивируется в понятиях или образах (в случае художественного творчества). Конечно, оперантное научение тоже может интерпретироваться как

хаотический полюс дарвиновского процесса. Однако вполне вероятно, что процессы оперантного приспособления действия к среде и извлечения из действия его смысла распределены в человеческом социуме и культуре, в связи с чем сам творец не переживает «полного дарвиновского цикла».

Особого внимания в этом контексте заслуживает проблема роли эмоций в творческом мышлении. Еще в школе О.К. Тихомирова удалось объективно зафиксировать возникновение эмоций в ходе решения задач и показать, что попытка контролировать эмоции приводит к блокировке решения. В многочисленных западных исследованиях с середины 1990-х гг. до настоящего времени (Айзен, Кауфман, Любарт, Гетц, Мартин и др.) продемонстрировано влияние эмоциональных состояний на творческое мышление. В нашей лаборатории установлен феномен «эмоциональной подсказки» (Е.А. Валуева, Е.М. Лаптева): испытуемые значимо чаще находят решение в интервале

нескольких секунд после того, как слышат восклицание типа «Ага!», означающее решение задачи. Этот эффект, как бы его ни интерпретировать, показывает, что эмоции не только являются естественным порождением функционирования когнитивных процессов, но активно влияют на них, приводя, в том числе, и к появлению творческих решений.

Эмоции могут выполнять роль неспецифического интегратора когнитивной деятельности, позволяющего учитывать широкий контекст и «размечающего» пространство поиска.

В целом представляется, что сегодня начинает складываться новое, более интересное понимание интуитивного полюса творческого мышления. Этот полюс предстает не пространством для комбинации идей и не ловушкой для моря случайной информации. Он оказывается отражением опыта практики не только самого творца, но и других людей, из которого путем «рефлексивной абстракции» возникают новые понятия и образы.

КОГНИТИВНО-КОММУНИКАТИВНЫЕ ПРЕДПОСЫЛКИ РАННЕГО РЕЧЕВОГО РАЗВИТИЯ

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В речи посредством тех или иных внешних средств человек отражает свое субъективное психологическое состояние. Звучащим или записанным словом мы выражаем мысль, впечатления, чувства. Слушающий или читающий человек извлекает мысль, чувства, знание из внешне выраженного слова. Способность переходить от субъективного состояния к его физическому выражению в звуке, а также понимать через звук психическое состояние другого человека составляет специфическую особенность речи человека и ее коренное, можно сказать, сущностное, свойство, определяющее ее природу.

Между тем именно этот вопрос остается глубокой научной проблемой. В речевых актах говорения и слушания с методологической точки зрения происходит взаимодействие субъективного и объективного, психологического и физиологического. Еще Августин Блаженный говорил об этом явлении: «Нет ничего более очевидного и в то же время – более таинственного, чем связь души с телом». Трудность состоит в том, что сегодняшняя наука не знает

объяснения для случаев прямого психического воздействия на какой-либо физический или физиологический процесс. Да и вопрос о понимании природы психики на основе данных современной психофизиологии все еще остается на далеких подступах. Тем не менее, акты психического выражения в звуке (т.е. акты речи) остаются повседневным явлением жизни людей в цивилизованных обществах. Каковы же подходы к научному объяснению соединения звука со смыслом в речи человека?

Современная когнитивная наука пристально занимается проблемой природы речи. Главенствующее место в ряду исследователей этой темы занимают психологи, для которых функционирование и развитие речевой способности является давним и разносторонне изучаемым объектом. В исследованиях физиологических механизмов речевых проявлений и языковых форм привлекаются новейшие технические средства анализа осцилляторной активности мозга, магнитных проявлений мозга, локализаций процесса в различных структурах головного мозга. Привлекаются специалисты, работающие в разных областях науки: психогенетики, изучающие возможность передачи языковой информации на основе структуры генома человека; исследователи языковых

возможностей высших обезьян; лингвисты, анализирующие структуру языков людей разных исторических периодов и разных национальностей. Свое место заняли работы по компьютерному моделированию речевой способности.

С нашей точки зрения, важное место в разработке поставленной проблемы должны занять исследования речевого онтогенеза, использующие значительные мировые разработки этой области. Ведь с первого момента появления на свет младенец подает звуковые сигналы, отражающие его скрытые психологические состояния. Эти звуки, получившие название младенческих вокализаций, стали предметом изучения большого круга современных ученых. Постоянно меняясь, к концу первого года они приобретают черты, уподобляющие их словам окружающих. Как это произошло? Каким образом звук «нащупал» смысл, а психическое состояние обрело в звуке свое материальное воплощение? Это – фундаментальный вопрос в понимании речевого онтогенеза.

Рассмотрим три линии раннего развития ребенка: а) голосовых звуков, б) интонации вокализаций, в) когнитивно-мотивационной сферы.

Исследования звукового состава младенческих вокализаций важны для понимания развития фонетически структурированной речи. Однако в них не решается вопрос, по какому механизму ребенок начинает использовать звуки для выражения смысла.

Детские интонации активно исследуются сейчас на Западе. Показано, что интонации младенцев, начинаясь с первого крика, обнаруживаются на протяжении всего первого года жизни ребенка и несут в себе смысловозначительную функцию.

Психологические и психофизиологические исследования когнитивно-мотивационной и пред-семантической сферы младенца раскрыли ее стремительное развитие с первых дней его жизни на протяжении 1-го года. Показано, что в начальных реакциях младенческого крика-плача отражается прирожденная способность к психическому переживанию эмоционально негативного характера. Вскоре она дополняется эмоционально позитивным состоянием, проявляющимся в гулении, улыбках, телодвижениях.

Новорожденный рано начинает отличать мать, ее лицо, голос. В два-два с половиной месяца замечает «правильность» или «неправильность» происходящих физических действий. В 3–4 мес. младенцы имеют обобщенное представление о кошках, птицах, лошадях; в 7–8 мес. различают предметы, учитывают постоянно их размеров; в 9 мес. могут отличить птицу от самолета. В это время ребенок понимает особенности ситуации, стоящей перед ним цели, может просить о помощи. С 7 мес. дети начинают выполнять простые действия по словесной просьбе. Начальные субъективные состояния ребенка трансформируются в более сложные пред-сознательные, а потом и сознательные. Субъективные переживания составляют семантическую сферу младенца, которая становится необходимой частью всякой осмысленной речи.

Анализ совокупности упомянутых фактов обнаружил основные черты механизма соединения звука и смысла в раннем возрасте ребенка. Природной составной частью этого механизма является безусловный рефлекс крика, с которым новорожденный появляется на свет. В этой реакции содержатся центральные элементы речевого акта: психологическое переживание и его выражение голосом. В нем содержатся также основные предпосылки развития этих элементов, что и наблюдается в экспериментальных исследованиях. Социальную составляющую образуют действия ухаживающих за новорожденным людей. Реагируя на крики-плачи ребенка устранением их причин, а на позитивные реакции младенца – иными формами их поддержания, люди бессознательно осуществляют оперантное научение младенца. В результате совокупности этих действий у ребенка вырабатывается поведенческий вербальный паттерн – дифференцированное голосовое (первоначально интонационное) реагирование в ответ на разные психические состояния. Этот паттерн лежит в основе приобретения малышом первых имитируемых слов. В развитой форме он функционирует и у взрослого человека. Обсуждаемое явление может быть использовано при обучении языку высших обезьян.

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АССОЦИАТИВНЫЕ ИЕРАРХИИ У КРЕАТИВНЫХ И НЕКРЕАТИВНЫХ ИСПЫТУЕМЫХ

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Идея связи креативности и ассоциативных процессов восходит к С. Меднику. Теория С. Медника основана на идее о том, что природа креативного мышления заключается в нахождении новых способов соединения существующих элементов. Исходя из этого, С. Медник предположил, что индивидуальные различия в креативности могут определяться характером ассоциативных процессов. Для характеристики ассоциативных процессов Медник вводит понятие ассоциативной иерархии (Mednick, 1962), которое описывает организацию ассоциаций между представлениями. С. Медник предположил, что креативные люди имеют более плоские ассоциативные иерархии, а некреативные – более крутые (см. рисунок 1).

Крутые ассоциативные иерархии характерны для некреативных людей и представляют собой небольшое количество сильных ассоциаций. Более плоский ассоциативный профиль, который соответствует *креативному* мышлению, предполагает: а) большее количество ассоциаций; б) меньшую стереотипность ассоциаций; в) меньшую скорость ассоциирования.

Таким образом, целью нашего исследования была непосредственная проверка гипотезы С. Медника о характере распределения ассоциативных иерархий у креативных и некреативных людей, а также выявление других особенностей процесса ассоциирования у людей с разным уровнем креативности.

В качестве стимульного материала были использованы рисуночный тест К. Урбана на невербальную креативность, а также список из 30 слов, частотность которых контролировалась согласно Частотному словарю современного русского языка (Шаров, 2001). Из тридцати слов 15 были высокочастотными, 15 – низкочастотными.

В исследовании приняли участие 52 испытуемых, в основном – студенты Московского государственного лингвистического университета. Средний возраст участников составил 19,4 года. 71% испытуемых – женщины.

По результатам выполнения теста Урбана были выделены группы высоко- и низкокративных испытуемых. В первую группу вошли 22 человека со средним тестовым показателем креативности 40 баллов ($SD=5,8$), во вторую – 21 человек со средним баллом 17,8 ($SD=5,0$). По результатам анализа ответов были построены распределения ассоциативных иерархий для двух групп испытуемых. Для этого была посчитана частота встречаемости слов-ассоциаций отдельно в группах высоко- и низкокративных испытуемых, под которой понимался процент людей, сгенерировавших данную ассоциацию. Ассоциации для всех 30 слов были упорядочены по частотности и усреднены. По усредненным значениям были построены графики распределения частоты

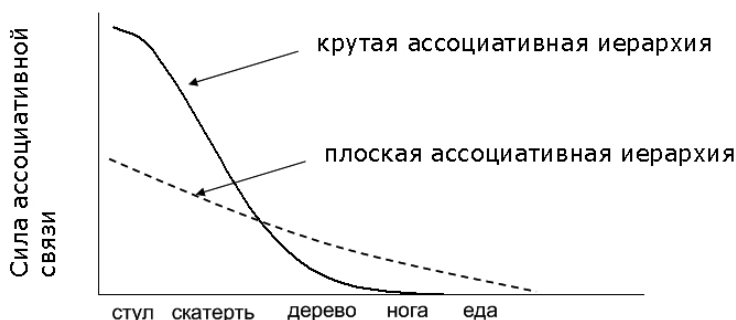


Рис. 1. Ассоциативные иерархии слова «стол» (Mednick, 1962)

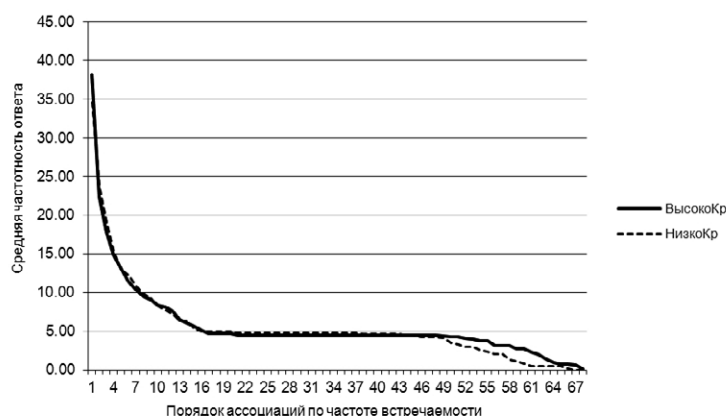


Рис. 2. Ассоциативные иерархии для высоко- и низкокративных испытуемых

встречаемости слов у креативных и некреативных испытуемых (см. рисунок 2).

На графике можно отметить две особенности. Во-первых, в противоположность предположению Медника, наиболее распространенные по частоте встречаемости ассоциации у высококреативных и низкокреативных испытуемых статистически значимо не различались по частотности (38,2% и 34,6% соответственно). Во-вторых, заметно, что в «хвосте» распределения у креативных испытуемых оказывается больше низкочастотных ассоциаций, чем у некреативных.

Также не было получено значимой связи ни между показателями по тесту Урбана и средней частотностью генерируемых ассоциаций ($r = -0,09$; $p = 0,5$), ни между показателями по тесту Урбана и общим количеством сгенерированных ассоциаций ($r = 0,15$; $p = 0,29$). Различия в частотности ассоциаций на высоко- и низкочастотные слова у высоко- и низкокреативных испытуемых проявились в виде тенденции: корреляция креативности с частотностью ассоциаций на низкочастотные слова $-0,19$ ($p = 0,18$), с частотностью ассоциаций на высокочастотные слова $0,14$ ($p = 0,33$), различия между двумя коэффициентами корреляции значимы на уровне $p = 0,1$. Также была обнаружена связь креативности с различиями в частотности первой и последней ассоциации в ассоциативном ряду ($r = 0,26$; $p = 0,06$), которая говорит о том, что чем выше уровень творческих способностей, тем больше различие в частотности между первой и последней ассоциацией.

Результаты описанного исследования представляются неоднозначными. С одной стороны,

проверка основных предположений С. Медника о характере ассоциирования людей с разным уровнем креативности дала фактически отрицательный результат: более креативные испытуемые не демонстрируют ни большего количества ассоциаций, ни меньшей их стереотипности. С другой стороны, мы обнаружили, что более креативные испытуемые имеют склонность реагировать на низкочастотные слова менее стереотипными ассоциациями, а на высокочастотные слова – наоборот, более стереотипными. Можно предположить, что характер распространения активации у высококреативных испытуемых является линейным и более направленным, а у низкокреативных, скорее, веерным. Т.е. активация от входного элемента у креативных людей распространяется по цепочке, активируя один элемент за другим, тем самым обеспечивая доступ к более удаленным ассоциациям. В противоположность этому у людей с низким уровнем творческих способностей активация от входного элемента распространяется по разным направлениям одновременно, активируя близлежащие узлы и не достигая за данный отрезок времени тех элементов, которые достигаются при линейном характере распространения активации.

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ВОЗРАСТНЫЕ ОСОБЕННОСТИ ЗРИТЕЛЬНОГО ОПОЗНАНИЯ У ДЕТЕЙ ПРЕДШКОЛЬНОГО ВОЗРАСТА

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Опознавание объектов внешнего мира является важнейшим условием познавательного развития ребенка. В реализацию этого процесса включаются нейронные сети, обеспечивающие интеграцию сенсорных признаков объекта, а также системы хранения и извлечения из памяти информации, необходимой для опознавания. Учитывая особую значимость опознавания зрительных стимулов в обучении навыкам письма и чтения, представлялось важным выяснение возрастных и индивидуальных особенностей зрительного опознавания у детей 5–6 лет – в период,

предшествующий систематическому обучению в школе. Адекватной моделью для изучения процессов, лежащих в основе зрительного опознавания, является предъявление неполных изображений разного уровня фрагментации. Эта модель позволяет оценить как степень зрелости механизмов, обеспечивающих интеграцию сенсорных признаков в целостный образ, так и механизмов управляющего контроля, вовлекаемых при необходимости извлечения информации из памяти. Особенности опознавания фрагментарных изображений изучались нами у 22 детей 5–6 лет на поведенческом и нейрофизиологическом уровнях. Для выявления специфики зрительного опознавания у детей этого возраста результаты исследования сопоставлялись с данными,

полученными на детях 7–8 лет (38 испытуемых). В ходе эксперимента после предупреждающего стимула испытуемому предъявлялось 16 знакомых изображений предметов и животных из стандартного набора (Snodgrass J.G, Corwin J., 1988) от трудно опознаваемого (2) уровня фрагментации до полного изображения (8 уровень). Показано, что в 5–6 летнем возрасте в сравнении с 7–8 годами значимо ниже эффективность опознания – средний уровень фрагментации, на котором происходило опознание у детей дошкольного возраста, составлял $6,48 \pm 0,89$, у детей 7–8 лет – $5,58 \pm 0,084$ ($p=0.001$). В дошкольном возрасте отмечается также большее количество ошибок (5–6 лет $5,86 \pm 1,158$; 7–8 лет $4,47 \pm 0,8$), однако из-за значительного индивидуального разброса, в особенности у детей 5–6 лет, различия в точности опознания не достигают уровня значимости ($p=0,07$). Мозговая организация зрительного опознания изучалась на основе анализа параметров ССП, регистрируемых в отведениях O1, O2, P3, P4, T3, T4, T5, T6, C3, C4, F3, F4, F7, F8. Усреднялись следующие классы ССП: ССП при неопознаваемом уровне фрагментации изображения (испытуемый отвечал «не знаю»); ССП при уровне фрагментации, непосредственно предшествующем правильному опознанию (ответ испытуемого «не знаю»), и ССП при правильно опознаваемом уровне фрагментации. Усредненные по классам опознаваемости стимула ССП отдельных испытуемых анализировались методом главных компонент. Суммарная амплитуда ССП на временных отрезках, соответствующих выделенным главным компонентам, обрабатывалась с помощью дисперсионного анализа (ANOVA RM). Использовались следующие факторы: «опознание», «полушарие», «отведения». Для выявления групповых различий использовался фактор «возраст» (5–6 и 7–8 лет). Достоверность различий суммарных амплитуд ССП в каждом из отведений анализировалась с использованием непараметрического критерия Wilcoxon. Анализ ССП выявил существенные особенности опознания у детей 5–6 лет. В этом возрасте, в отличие от детей 7–8 лет, не выявлены значимые различия амплитуды компонентов P100, N200 в затылочных областях. Участие этих корковых зон при опознании проявляется в значимом увеличении компонентов P300, N400 преимущественно в правом полушарии. Существенной особенностью опознания фрагментарных изображений у детей 5–6 лет является отсутствие при опознании значимых различий компонентов ССП в вентральной экстрастриарной коре (отведения T5, T6), являющейся ключевой

структурой в процессе интеграции сенсорных признаков объекта. В 5–6 лет отмечается также незрелость механизмов управляющего контроля, что проявляется в отсутствии характерного для более старшего возраста значимого усиления префронтального компонента N300–400, отражающего когнитивную категоризацию объекта (Schendan H.E., Maher S.M., 2008). В 5–6 лет не наблюдается усиление медленного позитивного комплекса (LPC), с которым связывается извлечение информации и ее удержание в памяти (Cabeza R et al., 2008). Таким образом, для 5–6 летних детей характерно как недостаточное участие вентральной зрительной системы в опознании фрагментарных изображений, так и незрелость механизмов управляющего контроля. Учитывая большую вариативность в показателях точности опознания в дошкольном возрасте, представлялось важным провести дифференцированный анализ нейрофизиологических показателей зрительного опознания у двух подгрупп: 1 – дети, опознающие изображения практически без ошибок (среднее количество ошибок 1.1 ± 0.37); 2 – дети, допускающие ошибки опознания (9.83 ± 1.23). Для детей первой подгруппы, возраст которых был больше ($6,17 \pm 0,068$), характерна большая реактивности модально-специфических зрительных структур и появление характерного для опознания усиления префронтального N400. Полученные результаты подтверждают данные (Фарбер Д.А., Бетелева Т.Г., 2005; Мачинская Р.И., 2006) о существенных морфофункциональных преобразованиях структур коры больших полушарий, участвующих в когнитивных процессах, в диапазоне от 5–6 к 7–8 годам и дают основание рассматривать этот возраст как сенситивный для формирования зрительного опознания и благоприятный для овладения навыками письма и чтения.

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ВЗАИМОДЕЙСТВИЕ СОБЕСЕДНИКОВ В ДИАЛОГЕ: РОЛЬ ПРАЙМИНГА

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Экспериментальный анализ дискурса — это совсем молодое направление исследований, которое оформилось в конце XX века с выходом книги Кларка «Agenes of language use» (Clark 1992). В ней автор описывает две психолингвистические традиции — «язык как продукт» и «язык как действие»; первая восходит к работам Хомского и Миллера, ее сторонники занимаются отдельными языковыми репрезентациями, т.е. «продуктами» процесса понимания высказывания; вторая берет начало с работ «философов языка» Остина, Грайса и Серля; ее последователи как раз и занимаются изучением различных аспектов речевого взаимодействия собеседников в процессе реальной коммуникации.

Один из наиболее актуальных вопросов в этой области связан с моделированием взаимодействия собеседников в диалоге. Несмотря на отдельные попытки создания модели диалогического взаимодействия (в частности, см. Clark and Wilkes-Gibbs 1986 и Pickering and Garrod 2004, =П&Г), общепринятой модели, которая бы объясняла и предсказывала большинство случаев реальной коммуникации и на которую бы опиралось большинство дискурсивных психолингвистов, пока не существует.

Описываемая Кларком совместная модель взаимодействия собеседников основана на **эксплицитном** фонде общих знаний. П&Г, наоборот, утверждают, что основная задача коммуникантов состоит в формировании не эксплицитного, а **имплицитного** фонда общих знаний, а в качестве ключевого понятия модели они предлагают понятие **уподобления** текущих репрезентаций говорящего и адресата. Противопоставление эксплицитного/имплицитного носит принципиальный характер, так как сознательная и целенаправленная деятельность (что предполагает модель Кларка) требует от человека постоянных значительных затрат когнитивных ресурсов, а бессознательная (модель П&Г) протекает без подобных затрат. В данной работе будет предложена **модель интерактивной координации** (=МИК), представляющая собой синтез этих подходов.

Согласно МИК, для успешного общения в диалоге собеседникам необходимо сформировать фонд общих знаний. Для этой цели у них в запасе имеется несколько **способов координации** совместной коммуникативной деятельности, для каждого из которых существует свой

собственный **механизм координации**. В начале диалога каждый из собеседников выбирает **коммуникативную стратегию**, которая может быть **эгоцентрической, нейтральной или кооперативной**; каждый тип стратегии связан со своим способом координации: эгоцентрическая связана с отсутствием координации, нейтральная — с уподоблением (соответствует модели П&Г), а кооперативная — с кооперацией (модель Кларка). Дальнейшее развитие диалога зависит от того, совпали или не совпали выбранные собеседниками стратегии. Если оба собеседника выбрали нейтральную или кооперативную стратегии, то типом координации такого диалога будет уподобление или кооперация. При выборе обоими эгоцентрической стратегии никакая координация в диалоге становится невозможна. Если же стратегии не совпали и хотя бы один из собеседников выбрал не-эгоцентрическую стратегию, то на первый план выходит вопрос об **уподоблении стратегий**. Если уподобление стратегий состоялось, то диалог имеет много шансов стать успешным, а способом координации такого успешного диалога может быть как кооперация, так и уподобление. Если уподобление не состоялось, то имеется большая вероятность коммуникативной неудачи, как явной, так и имплицитной. Другими словами, нескоординированный диалог принципиальным образом отличается от скоординированного диалога как с точки зрения его протекания, так и с точки зрения его потенциальной успешности.

Таким образом, понятие **уподобления** является важнейшим понятием как для модели П&Г, так и для МИК. Согласно модели П&Г, именно уподобление упрощает общение и служит основой успешной коммуникации в ходе диалога. Опираясь на работу Branigan et al. 2000, авторы предполагают, что базовым механизмом, который обеспечивает автоматизированное уподобление репрезентаций собеседников на всех уровнях обработки, является **прайминг**. Однако на самом деле в статье П&Г не было предложено механизма уподобления, и, тем самым, не оправдывает себя и само название статьи — «Toward a mechanistic psychology of dialogue», так как термины «уподобление» и «прайминг» традиционно используются как синонимы, являясь разными названиями неосознаваемого и неконтролируемого эффекта имплицитной памяти. С другой стороны, хотя явление прайминга, несомненно, существует на всех уровнях языковой обработки, его эффект никогда не достигает той силы, чтобы его можно было считать основным и тем более единственным механизмом, регулирующим

взаимодействие собеседников в диалоге, как это предполагается в модели П&Г. Встает вопрос: какова реальная роль прайминга в процессе речевой коммуникации?

В МИК уподобление является только одним из трех возможных способов координации совместных действий говорящего и адресата в диалоге, а механизмом уподобления (=прайминга) является **механизм остаточной активации**, предложенный в работе Pickering and Branigan 1998. Для подтверждения психологической реальности выделения различных коммуникативных стратегий рассмотрим результаты из работы Федорова 2009. В серии экспериментов, проведенных с русскоязычными носителями по методике диалога с обученным подыгрывающим (Branigan et al. 2000), важным дополнением дисперсионного анализа, подтверждающего значимый эффект прайминга, стал анализ индивидуальных особенностей языкового поведения испытуемых. В результате такого анализа нами было выделено три группы испытуемых: (i) те, которые почти всегда повторяют синтаксическую структуру своего собеседника, то есть проявляют **локальную согласованность** – примерно 35% от общего числа участников; (ii) те, которые, выбрав одну или другую стратегию, продолжают ее придерживаться, не обращая никакого внимания на синтаксическую структуру реплик собеседника; такие испытуемые проявляют **глобальную согласованность**, то есть ориентируются лишь на собственную речь – около 50% от общего числа; (iii) те, чье речевое поведение зависит от

других, экстрасинтаксических, факторов – 15% от общего числа.

Мы предполагаем, что нейтральную стратегию (=опирающуюся на уподобление) используют только те испытуемые, которые проявляют локальную согласованность; остальные, проявляющие глобальную согласованность, используют эгоцентрическую стратегию. Такой высокий процент эгоцентрической стратегии в данном исследовании может быть объяснен особенностями экспериментальной методики: легкостью заданий по описанию картинок, низкой мотивированностью людей к совместной деятельности и однообразием диалогических реплик. Таким образом, МИК помогает объяснить как регулярно наблюдающуюся зависимость силы эффектов прайминга от использованной методики, так и небольшой суммарный эффект синтаксического прайминга.

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МЕТАФОРИЧЕСКАЯ СВЯЗЬ ПРОСТРАНСТВО – ВРЕМЯ В СИСТЕМЕ ЖЕСТОВ У ГОВОРЯЩИХ НА РОДНОМ/ИНОСТРАННОМ ЯЗЫКЕ

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Концептуализация времени через пространственные понятия традиционно признается одной из базовых воплощенных метафор и возводится в ранг когнитивной универсалии (Alverson 1994). Связь пространства и времени ассиметрична; пространственные значения предшествуют развитию временных как в истории языка (Sweetser 1991), так и в освоении языка детьми (Clark 1973). Множественные психолингвистические эксперименты подтверждают, что взрослые говорящие постоянно опираются

на пространственные данные в своих суждениях о времени (Casasanto 2010).

В одном из недавних экспериментов испытуемым задавали предварительный вопрос, как, по их мнению, они будут показывать жестами временные отношения в прошлом и будущем; все испытуемые единодушно выразились в пользу жестов ВПЕРЕД – НАЗАД, однако непосредственно в ходе эксперимента никто из испытуемых не использовал этот жест (Casasanto, устное сообщение¹). Таким образом, у говорящих существует некое идеализированное представление о том, как они *должны*

¹ Выступление Д. Касасанто на 4й международной конференции «Metaphor in Language and Thought», Porto Alegre, 27 октября 2011.

жестиковать при разговоре о времени: они выстраивают временную ось через пространство и считают, вероятно, вербализуя лексические метафоры, что ПРОШЛОЕ – ПОЗАДИ, БУДУЩЕЕ – ВПЕРЕДИ. Однако это не подвергается на практике: бессознательно выбирается ось ПРОШЛОЕ – СЛЕВА, БУДУЩЕЕ – СПРАВА (или наоборот, в зависимости от направления письма в культуре говорящего, см. Casasanto...). По сути дела, эта разнонаправленность метафорических осей выявляет конфликт между вербальной и невербальной концептуализацией, ибо в языке – насколько известно на сегодня, ни в одном языке – мы не обнаруживаем следов временной метафоры, представляющей время как текущее слева направо / справа налево.

Характерно, что во всех этих работах рассматривается поведение человека, говорящего на родном языке. Нам представляется, что интересным объектом для исследования должны стать как раз говорящие на иностранном языке, и прежде всего те, чей уровень знаний недостаточен для свободного изложения мыслей. Жест и речь образуют единый коммуникативный сигнал, и в данном случае система жестов принимает на себя большую, чем обычно, семантическую нагрузку: подбор корректной лексической/грамматической формы зачастую становится осознанным, и то время, которое говорящий затрачивает на её поиск, нередко заполняется соответствующим иконическим жестом. Наша гипотеза заключалась в том, что концептуальная метафора ПРОШЛОЕ ПОЗАДИ – БУДУЩЕЕ ВПЕРЕДИ будет реализована в жестах изучающих иностранный язык, в отличие от традиционной временной концептуализации ПРОШЛОЕ СЛЕВА – БУДУЩЕЕ СПРАВА при высказывании на родном языке.

Трёх группам испытуемых¹, по 15 человек в каждой, был предложен текст объёмом около 200 слов на русском языке. В тексте излагалась история со сложной временной структурой:

при переводе его на романо-германские языки задействуется полный спектр глагольных видо-временных форм; использованы лексические маркеры времени, выражающие предшествование, одновременность и последовательность. После 3 минут на чтение испытуемым предлагалось пересказать текст на иностранном языке (испанский, французский и английский, в зависимости от группы), а затем пересказать текст по-русски.

В предлагаемом докладе мы представляем результаты нашего эксперимента, сравнив: а) использование жестов при высказывании на родном и иностранном языке (показатель в среднем в 3 раза выше во втором случае); б) использование иконических жестов при передаче временных отношений в сопровождении речи на родном и иностранном языке; в) использование жестов в трёх группах (что само по себе интересно, в силу традиционных затруднений с изучением системы романских времен у русскоговорящих студентов).

Делаются выводы об особенностях представления времени в системе жестов при высказывании на неродном языке: время действительно концептуализируется через пространственные отношения; чётко прослеживается связь СЕЙЧАС – это ЗДЕСЬ; наконец, удалённость в прошлом показывается жестом как ДВИЖЕНИЕ ВПЕРЕД чаще, чем ДВИЖЕНИЕ НАЗАД (что противоречит описанному у Casasanto сценарию ВПРАВО – ВЛЕВО). Мы предлагаем возможные объяснения полученных результатов через различия в концептуализации времени в родном и иностранном языке.

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¹ В качестве испытуемых выступили студенты младших курсов Уральского федерального университета.

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ИССЛЕДОВАНИЕ НЕЙРОФИЗИОЛОГИЧЕСКИХ МЕХАНИЗМОВ РЕШЕНИЯ СЛОЖНЫХ АРИФМЕТИЧЕСКИХ ПРИМЕРОВ

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Изучение нейрофизиологических механизмов решения арифметических задач в настоящее время остается актуальным. Решение математической задачи как типа операторской деятельности требует упорядоченного включения ряда когнитивных операций, дефекты формирования или реализации которых представляют интерес для нейропсихологов. В зарубежной литературе, как правило, не проводится выделение отдельных этапов выполнения таких задач, а в отечественных источниках вопросы специфики их решения рассматриваются косвенно или в теоретическом аспекте.

Цель работы – исследование нейрофизиологических коррелятов этапов решения арифметических примеров на сложение и умножение двузначных чисел. В исследовании приняли участие 22 человека. Участников информировали о порядке проведения тестовых процедур, безопасности методики и получали письменное согласие на участие в обследовании. В блоках было 100 примеров, для решения которых при сложении отводилось 20 с, при умножении – 50 с. Операнды и знаки операций предъявлялись последовательно в течение 700 мс каждый. При решении примеров участники отмечали каждую операцию нажатием на кнопку. Регистрация всех показателей проводилась с помощью электроэнцефалографа-анализатора «Энцефалан-131-03» монополярно по системе 10–20. Оцифрованные данные экспортировались в «MATLAB», где рассчитывались время решения (ВРеш), количество операций, вероятность ошибки (ВО), спектральная мощность ритмических диапазонов ЭЭГ и значения функции когерентности (КОГ). Достоверность различий оценивалась с помощью дисперсионного анализа MANOVA.

При решении примеров на сложение использовалось от 1 до 4 элементарных операций. Наблюдалась линейная зависимость ВРеш от количества операций, т.к. прибавление каждой из них приводило к приросту ВРеш на сходную

величину. Доминирующими были комбинации, состоящие из 2 операций с минимальной ВО. Для умножения алгоритм решения варьировал от 1 до 5 операций; наблюдалась куполообразная динамика ВРеш. Основная часть примеров решалась в 3 операции со сравнительно небольшой ВО.

ЭЭГ анализировалась на следующих этапах решения: чтение условия, решение, отдых, и на фрагментах записи, соответствующих примерам, решаемым в разное число операций. При сложении чтение условия приводило к формированию в дельта-диапазоне 4 фокусов активности: в лобно-центральной и теменной области левого полушария, в правых теменно-височной и лобной зонах. Лобно-центральный и теменной фокусы левого полушария присутствовали в тета-диапазоне, но были менее выражены. Решение сопровождалось увеличением в ЭЭГ количества дельта-волн и слиянием фокусов, в результате центральная область обоих полушарий и правые теменные области были наименее активированы. В тета-ритме происходило усиление левого лобного фокуса со смещением в передние области. Окончание процесса вычисления сопровождалось некоторым ослаблением мощности во всех диапазонах с сохранением фокусов, характерных для стадии решения. При решении примеров на умножение чтение условия сопровождалось появлением дельта-фокусов в лобно-центральной и теменной области левого полушария и височного фокуса в правом полушарии. За счет смещения лобного фокуса в центральные области асимметрия тета-ритма сглаживается. Десинхронизация альфа-ритма была более выражена в сравнении с аналогичной стадией для сложения. Решение примера приводило к усилению дельта-частот и сглаживанию асимметрии альфа-ритма, а окончание было сходно с другими стадиями, отличаясь ослаблением мощности дельта-частот. Было также выявлено, что оптимальное количество этапов решения (2 операции для сложения, 3 для умножения) сопровождалось небольшими значениями спектральной мощности; высокие значения были связаны с пропусками решения и максимальным числом операций. Наибольший интерес представляют фокусы, локализованные

в лобной, теменной и височной зонах, поскольку здесь предполагается локализация части общемозговой сети, связанной с процессами памяти (Anderson et al., 2010). Усиление дельта-фокусов в левом полушарии и ослабление в правом связывается с избирательным подавлением «сети ментальной арифметики», приводящем к активации только необходимой части когнитивных ресурсов (Dimitriadis et al., 2010). Сходная локализация фокусов дельта- и тета-активности может отражать их взаимодействие, создающее основу для обработки информации, кодирования и поиска арифметических данных в долговременной памяти (Núñez-Peña, 2008).

Анализ динамики КОГ показал присутствие в фоне высокого уровня синхронизации внутриполушарных и межполушарных связей, в особенности для дельта-частот. При чтении условия происходило появление межполушарной асимметрии КОГ в виде усиления синхронизации в левом полушарии между лобными и теменными, лобными и височными областями, а также в обеих височных зонах. В области альфа-диапазона усиливалась связь между левой лобной и теменной областями, что, возможно, связано с подготовкой к следующему этапу. Для тета-частот показано усиление связей в правом полушарии, что сохранялось при решении примера. После окончания решения в правом полушарии уровень связей височной зоны с лобной и теменной возвращался к фоновым значениям. При умножении асимметрия КОГ сглаживалась из-за сохранения в правом полушарии фоновых связей. Для всех состояний в дельта-диапазоне происходило усиление КОГ височных зон. При чтении условия усиление связи лобной и височной зон слева происходило в альфа- и тета-диапазоне. При решении максимум изменений происходил в тета- и альфа-частотах, в

дельта-ритме сохранялась фоновая КОГ. После окончания решения восстановления уровня синхронизации не происходило, но значения КОГ было ближе к фоновым, чем при сложении. Различия между задачами могут быть связаны с отражением в усилении левополушарной КОГ с математическими способностями и принятия решения, а правополушарной – с реализацией пространственного алгоритма (Симонов, 1981, 107 с.). Этот факт наряду с описанной локализацией фокусов ЭЭГ может быть связан со спецификой арифметических задач, требующих вовлечения дополнительных операций (активация рабочей памяти). Показана связь тета-ритма в области зоны Брока и левой теменно-височной коры с активацией внутренней речи (Лурия, 2002, 154 с., De Smedt, Boets, 2010). Наличие в КОГ лобно-височной связи может отражать связь зоны Брока при помощи дугообразного пучка с левой зоной Вернике (Лурия, 2002, 154 с.), образуя систему, отвечающую за вербальный способ кодирования числовой информации, а наличие межполушарной связи височных зон – координацию работы центров Вернике.

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КОНЦЕПТУАЛЬНАЯ МЕТАФОРА «ПРИРОДА – ЧЕЛОВЕК» В ПАРЕМИЧЕСКОМ ФОНДЕ РУССКОЙ ЛИНГВОКУЛЬТУРЫ: ОСОБЕННОСТИ РЕПРЕЗЕНТАЦИИ

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На сегодняшний день убедительно доказано, что концептуальная метафора имеет укорененность в сознании людей (Лакофф, Джонсон, 2004), входя в систему когнитивных структур и реализуясь в речевой практике. Язык, играя

ключевую роль, позволяет материализовать концептуальные структуры, связать воедино мыслительные и речевые процессы. Однако вопрос о конкретных способах формирования и функционирования концептуальных метафор в лингвокультурном пространстве до сих пор остается открытым. Недостаточно изучена вся система концептуальных метафор, ее репрезентация в различных дискурсах.

В связи с этим актуальным представляется изучение и описание реализации концептуальной метафоры «природа – человек» в паремическом фонде русской лингвокультуры. Вхождение древнейшей «пралогической» (Маслова, 2007: 92) метафорической структуры «природа – человек» в современное лингвокультурное пространство осуществлялось на протяжении веков с развитием языка и культуры их носителей. Одним из конкретных путей данного «вхождения» был путь фиксации антропоморфных архетипических элементов в паремических образованиях. Благодаря чему когнитивная метафорическая модель «природа – человек» воспринимается как норма или вообще не осознается носителями языка.

В качестве материала исследования были отобраны пословицы о природе из словаря В.И. Даля (Даль, 1994), содержащие метафорическую модель «природа – человек». Общий объем выявленных единиц чуть более 100.

В ходе анализа исследуемого материала было установлено, что метафора в пословицах и поговорках реализуется на трех уровнях:

1) дискурсивном (в конкретных условиях речи языковая личность прибегает к единицам паремического фонда, актуализируя концептуальный пласт, условия общения обуславливают образное описание ситуации, при этом реципиент речи должен адекватно трактовать вкладываемый смысл, соотносимый с референтной ситуацией, а не буквальным пониманием паремии);

2) прагматическом (мотивация языковой личности передать объективную ситуацию в «метафорически кодированном» виде, актуализируется психолингвистический аспект порождения речи);

3) когнитивно-структурном (построение самой паремии может осуществляться по какой-либо метафорической модели, которая в большинстве случаев не осознается носителями языка).

В центре внимания нашей работы было исследование когнитивно-структурного уровня реализации метафоры (основных моделей, посредством которых она реализуется в текстах паремий). Именно этот уровень паремий позволяет концептуальной метафоре как когнитивному механизму и лингвокультурному образованию интериоризованно входить в когнитивную систему каждого отдельного человека. Представим некоторые модели.

По народным представлениям, выраженным метафорически, в природе постоянно происходит борьба: *В ноябре зима с осенью борется; Весна зиму поборола*. Поэтому возникает **модель**

спора, борьбы, противопоставления, войны. Сезоны (весна – осень, зима – лето) противопоставляются как противники:

Осень прикажет, а весна свое скажет;

Осень говорит: уклочу, весна: как захочу;

Осень говорит: я поля уряжу, весна говорит: я еще погляжу!

Различные объекты могут быть в состоянии противоречия. *День вечеру не указчик; День дню не указчик*.

Природа может быть агрессивной, недружелюбной по отношению к человеку, негативно влияя на его поведение, что также отражается в пословицах этой модели: *Девятая волна добывает; Ветер взбесится и с бобылей избы крышу сорвет; Ветер шелоник, по Онеге разбойник; Мороз ленивого за нос хватает, а перед проворным шапку снимает; Мороз не велик, а стоять не велит*. Данная метафорическая модель характерна для русской лингвокультуры, также встречается в поэтических текстах (Хамитова, 2009) и может быть обусловлена объективным фактором – суровым климатом.

Метафорическая **модель труда**, представленная в системе пословиц и поговорок русского языка, характеризует глубокий взгляд жителя аграрной страны, для которого природа и труд тесно связаны между собой. Осмысляя и концептуализируя природу, человек проецирует собственную деятельность на природные объекты:

Заря деньгу дает (кует);

Вода все кроет, а берег роет.

При этом в пословицах метафорически отражается аксиологический элемент осознания действительности, для земледельца земля – благо: *Добрая земля больше подымет*. Если человек выступает не творцом и преобразователем, а пускает все на самотек, то в пословицах это отражается метафорически: *Дождем покрыто, ветром огорожено (о жилье)*.

На основании проведенного исследования можно утверждать, что в пословицах концептуальная метафора «природа – человек» репрезентирована в основных своих моделях: движение, эмоции, атрибут и т.д. (Хамитова, 2009). В то же время очевидно, что корреляция моделей пословичной и поэтической метафорик не влияет на их количественное наполнение и содержание. Реализация данной концептуальной метафоры в паремическом фонде принципиально отличается от реализации в поэтической картине мира: народный, во многом аграрный, взгляд и ценности отражены в паремическом фонде, что отражается в характере метафорических образов и аксиологических элементах.

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ПРОБЛЕМА ПРОИСХОЖДЕНИЯ ПСИХИКИ

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Анализ различных биологических эволюционных концепций показывает, что в филогенетическом контексте психику следует рассматривать в качестве одного из факторов биологической эволюции живых систем; она ориентирует и направляет ход этого процесса. Подобная ориентировочная функция обозначена в ряде современных эволюционных концепций (эпигенетическая теория эволюции, концепция естественного эволюционного упорядочения), хотя непосредственно о психике речи не ведется. Кроме того, данный тезис согласовывается с идеями В. А. Вагнера и А. Н. Северцова.

Одной из первых задач, встающей перед психологом-исследователем, разрабатывающим проблему места и роли психического в эволюционном процессе, является решение вопроса о «точке отсчета» – моменте возникновения психики в процессе развития всего мира в целом. В частности, к этому же проблемному полю принадлежит вопрос о происхождении когнитивного компонента психического отражения.

На настоящий момент в философии и науке существует множество альтернативных концепций, объясняющих процесс генезиса психики определяющих момент ее возникновения. Их можно классифицировать на несколько общих групп:

1) Панпсихизм – всеобщее одушевление материи; позиция, согласно которой психика наличествует у любого объекта в природе (Сократ, Платон, Спиноза, Гегель, Г.Т. Фехнер и Ж.Б. Робине). Ключевым недостатком данных концепций является возведение частного до всеобщего: психика, как форма отражения и информационного упорядочения материальных процессов определенного уровня развития, распространяется на все виды взаимодействий, наличествующих в материальном мире.

2) Биопсихизм акцентирует внимание на качественном отличии живой и неживой материи, утверждая, что психика имеется у всех

живых систем (И. Гоббс, Э. Геккель, В. Вундт, Я.А. Пономарев, П.К. Анохин). На современном этапе развития науки данный подход представляется весьма перспективным, однако в большинстве биопсихических концепций отсутствует разрешение ряда принципиальных проблем, связанных с принятием данной точки зрения. Во-первых, не решается проблема отличительных особенностей психического и физиологического, что имплицитно сводит психический уровень организации к биологическому. Кроме того, зачастую исследователи, постулируя наличие психики у всех живых систем, не осуществляют анализа процесса и закономерностей развития психических феноменов в ходе эволюции, как и анализа специфических уровней и форм психической организации при условии, что в рамках принимаемой точки зрения такая организация наличествует у чрезвычайно разнообразных групп живых существ.

3) Анималопсихизм – наиболее разработанный и широко принимаемый подход, приписывающий психические феномены не всему живому, а лишь определенному царству живых организмов – животным (Г. Спенсер, И. М. Сеченов, А. Н. Северцов и Н. Н. Ладыгина-Котс). Невзирая на, казалось бы, очевидную обоснованность анималопсихизма, многие исследователи принимают его аргументацию имплицитно, не ставя вопрос об объективном критерии психического. Кроме того, при принятии данной точки зрения весьма остро встает вопрос об отличительных особенностях царства животных (metazoa), как обладателей психической формы регуляции жизнедеятельности, учитывая также то обстоятельство, что многие протисты (protozoa), включая тех, что по своей организации оказываются ближе к растениям или грибам, также демонстрируют проявления психических феноменов.

4) Нейропсихизм. Согласно ему, психика, являясь атрибутом нервной системы, наличествует лишь у тех животных, у которых таковая имеется (В. А. Вагнер, В. Б. Швырков). Слабой стороной нейропсихизма в целом является прежде всего то, что в нем нарушается один из фундаментальных принципов филогенетического

развития – принцип ведущей роли функции по отношению к органу, согласно которому сначала возникает специфическая функция (в данном случае – психика), позже организующая под себя соответствующий орган – нервную систему.

5) Антропopsихизм признает наличие психики только у человека (Аристотель, Р. Декарт). Недостатком данного подхода является возведение частного (сознания, как высшей формы психического отражения, присущей человеку) до общего – психики в целом.

6) В качестве отдельной группы следует выделить теорию А.Н. Леонтьева и основанные на ней более современные концепции. В качестве объективного критерия психического А.Н. Леонтьев предлагает чувствительность – способность живой системы реагировать и ориентироваться на такие воздействия и факторы внешней среды, которые непосредственно не используются ею в целях конструктивного и энергетического метаболизма, но при этом соотносят живую систему с такими факторами, выполняя сигнальную функцию. На основе данного критерия Леонтьев приписывал психику животным и некоторым протистам. Однако современные научные данные показывают, что способность к чувствительности наличествует у многих представителей других царств живой природы: бактерий, грибов, растений. Между тем весь инструментарий данной концепции рассчитан именно на описание психических феноменов животных и протист, но оказывается непригоден для изучения психики у представителей других царств, учитывая, что по большинству параметров своей жизнедеятельности эти живые системы существенно качественно отличаются от организмов тех групп, на которые была рассчитана периодизация Леонтьева.

Проведенный нами аналитический обзор эволюционных, биогенетических и психологических концепций показывает, что ни одна из них не содержит исчерпывающего ответа на вопрос о генезисе и эволюции психики. Однако мы можем сформулировать ряд ключевых тезисов, учет которых имеет принципиальное значение для решения этой проблемы на современном этапе развития науки:

- Анализировать процесс генезиса и эволюции психики следует исходя из принципа единства живой системы, среды ее обитания и особенностей взаимодействия с данной средой, что, в частности, вытекает из концепции генезиса психики А.Н. Леонтьева. Иначе говоря, филогенез психики носит коэволюционный характер;
- Специфические свойства психического уровня организации начинают складываться еще до его непосредственного формирования, проявляясь в том числе и в неживой природе, как пример, направленность («интенциональность» по Д. Деннету) материальных процессов;
- Следует допустить существование психики (или ее аналогов) у всех живых организмов;
- Для решения вопроса о генезисе психики, а также для выделения форм и уровней ее организации необходимо выработать систему из нескольких критериев, позволяющую комплексно оценивать специфику взаимосвязи той или иной живой системы с окружающей ее средой;
- При проведении периодизации развития психики необходимо учитывать несовпадение уровней психической и морфофизиологической организации живых систем.

УПРАВЛЕНИЕ ПОТЕНЦИАЛОМ СИСТЕМЫ РАСПРЕДЕЛЕННЫХ СЕНСОРОВ В НЕОДНОРОДНОЙ НЕСТАЦИОНАРНОЙ СРЕДЕ С ПОМОЩЬЮ СИМУЛЯТОРА СОЗНАНИЯ

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Самоопределение человеческого сознания осуществляется построением промежуточных представлений о себе, которые можно назвать симуляторами сознания. К ним можно отнести устройства с искусственным интеллектом,

которые облекаются в совокупность физических и математических моделей, алгоритмов и технологических форм, в частности, к ним относятся системы сенсоров (приемников и источников зондирующего поля), пространственно распределенных в неоднородной нестационарной среде. Симулятор такой системы (далее просто симулятор) осуществляет автономное адаптивное наблюдение и исследование внешнего окружения в соответствии с заданной при его создании стратегией. Функционирование симулятора

такой системы заключается в восприятии элементов в окружающей среде и либо в определении их связей с имеющимися в составе симулятора представлениями (наблюдение), либо в расширении имеющихся представлений путем дополнения новых элементов к имеющимся элементам (исследование). На основе когнитивного анализа в рассматриваемом симуляторе можно выделить компоненты и режимы, аналогичные тем, которые характеризуют сознание человека, и наметить пути построения используемых при научном анализе методов физического и математического моделирования. Восприятие внешних (дистанцированных) элементов сознанием человека и, по аналогии, симулятором сознания осуществляется системой сенсоров и манипуляторов, непосредственно контактирующих с физическими полями, соединяющими сознание и объекты восприятия. Концентрация сознания при восприятии внешнего элемента осуществляется переориентировкой внутреннего состава путем априорно осознанного ослабления малозначимых связей элементов сознания и усиления ожидаемых (в рамках известного состава) связей и элементов, тяготеющих к вновь воспринимаемому и вновь утверждаемому элементу на основе, в частности, принципов аналогии, долженствования и гармонии. Соответствующая переориентация имеющегося состава элементов сознания и, по аналогии, симулятора основывается на формировании представления об уравновешенной, известной ситуации (невозмущенный состав), о наблюдаемом или исследуемом возмущении (утверждаемый тезис – объект) и о мешающих помеховых возмущениях (анти-тезис – отсутствие объекта). Последовательные стадии переориентации состава (элементы траектории поиска) выполняются либо целевым образом (при наблюдении), либо в режиме свободного поиска (при исследовании). Стратегия функционирования (предназначение) симулятора определяется заданной при его создании целью – наблюдением и исследованием объекта. Выполнение такой задачи заключается в поиске и принятии решения в пределах заданного многомерного пространства параметров модели наблюдаемого объекта (аналогу определенного состава и связей элементов сознания). Каждый элемент и представление в сознании и, соответственно, в симуляторе имеет форму бинера, то есть является парой взаимно противоположных компонент – утверждения и его формального отрицания. Компоненты бинера интерпретируются в понятиях пары сигнал-шум. Синтез (нейтрализация) как элементарных бинеров, так и более сложных бинеров представлений

в симуляторе осуществляется путем принятия решения, при этом используются адаптивные к контексту и априорной информации решающие правила. Аналогом мышления в симуляторе является развитие моделей многомерного пространства параметров, которое осуществляется включением новых элементов представлений и исследованием его структуры и определением оптимальных траекторий поиска решений. В общем случае, стратегия существования симулятора сознания может быть определена лишь с привлечением социального аспекта, то есть привлекая понятия связей и взаимодействий с другими подобными симуляторами, а также с управляющим центром. Каждый элементарный компонент состава (локально адаптированные в пространстве параметров решающие правила) симулятора можно рассматривать как аналог совокупности нейронов. Совокупность элементов и представлений образует сложнопостроенную нейроноподобную сеть, состав и структура связей которой перестраиваются в зависимости от решаемой задачи и обновляемой априорной информации. Поскольку такой симулятор должен работать в неоднородной нестационарной среде, его алгоритмы должны оптимальным образом адаптироваться к изменчивости среды, что обеспечивает оптимальное управление потенциалом сенсорной системы.

Модель симулятора реализована в виде совокупности алгоритмов, функционирования автономной пространственно распределенной системы акустического наблюдения и исследования неоднородностей в мелком море, называемой маломодовой импульсной томографии (МИТ). Адаптация работы МИТ к изменениям условий наблюдения в мелком море обеспечивается при использовании постоянно обновляемых данных о структуре гидроакустического (ГА) волновода, конфигурации сенсоров (приемных и излучающих решеток), параметров реверберационных помех и шумов, обеспечивающих соответствующую цели подстройку структуры симулятора. Управление потенциалом системы состоит в фокусировке сенсоров, оптимизации пороговых значений, адаптивной подстройке траектории поиска и решающих правил. Указанные априорные данные формируются в виде геоинформационной океанологической (ГИО) модели (в виде базы ранее измеренных данных) района наблюдений с учетом адаптивного текущего обновления её параметров. Кроме того, используются физические модели формирования информационных каналов передачи данных об объекте и помехах в них. В их число входят модели распространения

гидроакустических полей в плоскостных волноводах, дифракции ГА полей, наблюдаемых объектами, рассеяния ГА полей случайно на распределенных неоднородностях океанической среды, формирования гидроакустических НЧ шумов ветрового волнения, а также модели возбуждения маломодовых ГА сигналов совокупностью взаимодействующих излучателей. Совокупность указанных моделей, а также моделей поиска и принятия решений объединяются в имеющую нейроноподобную структуру имитационную модель наблюдения (ИН модель), которая в симуляторе является аналогом разума. Такая модель позволяет трансформировать эмпирические данные в априорную информацию в форме гипотез, используемых при синтезировании бинеров элементов состава (совокупности нейронов). Синтез осуществляется адаптивной оценкой значений параметров наблюдаемых

неоднородностей, с использованием методов регуляризации, в том числе метода обобщенной невязки Тихонова. ИН модель при этом выполняет процессорные функции. Исследование и гармонизация структуры пространства параметров с помощью ИН модели является аналогом мышления. В этом случае осуществляется априорная оптимизация траекторий поиска решений и решающих статистик и порогов, в том числе на основе использования нейроноподобных контекстно-ориентированных решающих статистик. Такой режим функционирования симулятора аналогичен нейтрализации бинеров представлений, то есть осмыслению (уравновешиванию) состава сознания симулятора. Частным случаем переориентации сознания симулятора, выполняемой ИН моделью, является оценка размеров и конфигурации поля зрения симулятора в зависимости от изменяющихся условий и объектов наблюдения.

КОНЦЕПТУАЛЬНЫЕ СТРУКТУРЫ КАК ПСИХИЧЕСКИЕ НОСИТЕЛИ ПОНЯТИЙНЫХ СПОСОБНОСТЕЙ

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Основу акта понятийного отражения составляют «концептуальные структуры», или «концепты». Целый ряд новых представлений о природе концепта разработан в современной когнитивной лингвистике, в которой, в отличие от традиционной лингвистики, принято считать, что когнитивные (ментальные) структуры первичны по отношению к лингвистическим феноменам. Соответственно на первый план выходит экспириенциальный подход (от англ. *experience* – опыт): изучению механизмов естественной категоризации и концептуализации с учетом индивидуального опыта носителя языка.

В рамках когнитивной лингвистики концепт определяется как совокупность всех смыслов, схваченных словом. Концепт характеризуется следующими особенностями: относительная независимость от слова, поскольку только часть содержания концепта находит свое выражение в языке; наличие множества признаков, в том числе несущественных и коннотативных; подвижность границ; выступает как свернутый текст; является элементом индивидуальной «картины мира»; отличается культурной специфичностью.

В психологии понятийного мышления «концепт» как психологическая категория впервые появился в работах Л. М. Веккера (1976), который обосновал необходимость изучения концептуальных структур как психических носителей свойств понятийного мышления.

В ходе лингвистических и психологических исследований сложились предпосылки, позволяющие, на наш взгляд, говорить о необходимости различения терминов «понятие» и «концепт». Понятие – это внешняя субъекту единица знания, которая может быть им усвоена. Концепт (концептуальная структура) – это ментальная структура «внутри» индивидуального ментального опыта, соотношенная с определенным элементом символической системы (прежде всего словесным знаком) и выступающая в качестве психического носителя понятия (его «операнда»). Концепт в процессе своего функционирования порождает определенное ментальное пространство со своей топологией, метрикой и динамикой, в рамках которого, в свою очередь, строится ментальная репрезентация происходящего (актуальный ментальный образ того или иного конкретного воздействия).

Результаты наших эмпирических исследований показали, что особенности организации концептуальной структуры могут быть описаны следующими отличительными свойствами: разноразмерность – мера представленности в

ментальном пространстве концепта уровней разной степени обобщенности (степень его дифференцированности и иерархизированности); интегративность — мера включенности в когнитивный состав концепта словесно-речевой, визуальной и сенсорно-эмоциональной модальностей опыта, актуализация которых осуществляется в режиме обратимого перевода информации с языка одной модальности на язык другой; экстенсивность — мера мнемической активности концепта в виде широты его актуального и потенциального семантического поля; избирательность — мера произвольной и произвольной регуляции (контроля) процесса переработки информации в ментальном пространстве концепта; интенсивность — мера насыщенности ментального пространства концепта сенсорными и эмоциональными впечатлениями (Холодная, 2010).

Согласно нашим данным, процесс установления межпонятийных связей является гибким, индивидуально вариативным и «открытым» по своим результатам: понятийные связи не столько воспроизводятся, сколько конструируются субъектом. Благодаря механизму разветвления ментальных пространств, порождаемых концептуальными структурами, движение понятийной мысли приобретает высокую степень свободы и в то же время оказывается избирательно контролируемым за счет перемещения в системе разнородных категориальных признаков; в системе разнородных визуальных схем; в системе разнородных сенсорно-эмоциональных впечатлений; в системе семантического контекста, извлекаемого из содержания индивидуального ментального опыта. Таким образом, уровень организации концептуальных структур оказывает влияние на процессы межпонятийных взаимодействий.

Для обсуждения представлены два вопроса: 1) какова психологическая основа процесса понятийной идентификации (подведения конкретного понятия под общую категорию). Использовалась авторская методика «*Ранжирование видовых понятий*»; стимульный материал состоял из 5 наборов слов; каждый набор включал три близких по значению родовые категории (например, «рисунк», «изображение» «модель») и список из одних и тех же 25 конкретных слов, каждое из которых в той или иной мере можно было подвести под все три родовые категории; 2) как избирательность актуализации концептуальных структур (авторская методика «*Отгадывание понятий по заданным признакам*») связана со способностью к категориальному обобщению (методика «*Обобщение трех слов*»).

Полученные результаты свидетельствуют о том, что реакция понятийной идентификации (подведение некоторого множества видовых понятий под определенную родовую категорию в качестве ее «примеров») — это результат одновременного взаимодействия *эффекта прототипичности* (меры совмещенности пространственных схем видового понятия и родовой категории, в ходе которого тот или иной «видовой пример» проверяется на его соответствие «родовому примеру») и *эффекта контекстности* (влияния на преимущественный выбор определенного видового понятия как примера категории его семантического контекста, зависящего от содержания индивидуально-ментального опыта).

В свою очередь, согласно результатам факторного анализа, два показателя избирательности поиска понятий по критерию соответствия «отгаданных» понятий всем трем заданным признакам входят в один фактор (38,9%) вместе с показателем успешности категориального обобщения с весами 0,712, 0,816, 0,843 соответственно. Следовательно, избирательность процесса актуализации концептуальных структур, обнаруживающая себя в поддержании направленности внимания и соответственно в объективированности понятийной мысли (то есть той меры, в которой в когнитивном продукте — «отгаданном» понятии — представлены объективно заданные признаки), связана со способностью к категориальному обобщению.

Анализ устройства концептуальных структур позволяет говорить о том, что они являются психическим носителем трех видов понятийных способностей, таких, как: семантические способности (имеют отношение к усвоению, хранению и актуализации значений словесных знаков), категориальные способности (обеспечивают оперирование категориальными признаками разной степени обобщенности и образование межпонятийных связей в системе видовых и родовых понятий) и концептуальные способности (лежат в основе процесса порождения новых ментальных содержаний).

Таким образом, концептуальные структуры (концепты) «снимают» в своем составе индивидуальные когнитивные ресурсы. Они выступают в качестве уникального психического механизма, который, с одной стороны, характеризует общие закономерности функционирования понятийного мышления (возможность опосредованного, обобщающего и порождающего познания) и, с другой, — выстраивается в пространстве индивидуального ментального опыта конкретного человека.

НЕОСОЗНАВАЕМОЕ ВОСПРИЯТИЕ АКУСТИЧЕСКИХ СТИМУЛОВ И ЭЛЕКТРИЧЕСКАЯ АКТИВНОСТЬ МОЗГА ЧЕЛОВЕКА: ВЫЗВАННЫЕ ПОТЕНЦИАЛЫ

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Неосознаваемое восприятие имеет важное значение при формировании поведения человека (Костанов, 2004). Большая часть экспериментальных данных при изучении этой проблемы получена при использовании зрительной информации. Однако акустическая информация при организации адаптивных реакций имеет не меньшее значение.

Целью работы стало определение влияния неосознаваемого восприятия акустических стимулов на вызванную электрическую активность мозга человека.

Для этого у испытуемых регистрировали вызванные потенциалы на акустические стимулы, предъявляемые в парадигме неосознаваемого прайминга.

Стимулами для прайминга выбрали 2 одно-словых слова русского разговорного языка с отличием только в одну гласную: сад и суд. Длительность слова-цели – 375 мс. Слово-прайм представляло собой слово «сад» уменьшенное по длительности. Для обеспечения неосознаваемости восприятия слова-прайма его предъявляли в условиях маскировки типа «сэндвич» (Greenwald et al., 1996), т.е. между 2 тональными послылками с частотой заполнения 1000 Гц. Длительность слова-прайма составила 112 мс. Для повторного прайминга взяли слово-цель «сад». В случае альтернативного прайминга слово-цель было слово «суд». Интервал между окончанием второй тональной послылки и началом слова-цели составил 50 мс. Для контроля в последовательность стимулов включили стимулы с изолированным словом-целью – вместо слова-прайма между тональными послылками была тишина. Все стимулы предъявляли через наушники Acoustics K 141 studio (неравномерность в диапазоне от 40 Гц до 10000 Гц не превышала ± 10 дБ). Параллельно звуковым стимулам на экране ЖК-монитора предъявляли написанные слова «сад» и «суд». По инструкции, испытуемый должен был нажимать на кнопку джойстика, как только слово, произнесенное в наушниках, совпадет со словом на экране. Для смещения внимания от предъявляемых звуковых

стимулов испытуемого просили вести счет своим нажатиям в зависимости от слова на экране.

Во время опыта регистрировали электроэнцефалограмму от 19 отведений (Fp1, Fp2, F3, F4, F7, F8, Fz, Cz, Pz, T3, T4, T5, T6, P3, P4, P5, P6, O1, O2) в соответствии с международной системой 10–20. Запись осуществляли монополярно, с использованием объединенного ушного референта $((A1+A2)/2)$.

После опыта испытуемого просили подробно описать, какие слова он слышал в наушниках. В своих отчетах ни один из испытуемых не отметил наличия слова «сад» или «суд» между тональными послылками.

Результаты исследования показали, что в случае повторного прайминга (сад-сад) достоверно увеличивается амплитуда усредненных вызванных потенциалов (УВП) и уменьшается латентный период по сравнению с параметрами УВП на изолированное предъявление слова-цели. Статистически достоверное увеличение амплитуды получено для пика P190 в центральных отведениях и отведениях левого полушария. Статистически достоверное уменьшение латентного периода выявлено для пика N70 в правых переднелобном и задневисочном отведениях.

При альтернативном прайминге (сад-суд) показано достоверное уменьшение амплитуды УВП и увеличение латентного периода по сравнению с параметрами УВП на изолированное предъявление слова цели. Наибольшее уменьшение амплитуды получено для пика P190 в центральных отведениях и теменном отведении левого полушария. Статистически достоверное увеличение латентного периода выявлено для пика N70 в центральном и затылочном отведениях правого полушария.

Полученные результаты свидетельствуют о влиянии неосознаваемого акустического прайминга на электрическую активность мозга человека. Это влияние разнонаправлено при повторном и альтернативном прайминге.

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БЛЕНДЫ-ГИБРИДЫ В РУССКОМ ЯЗЫКЕ (ОПЫТ КОНЦЕПТУАЛЬНОГО АНАЛИЗА)

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В ряде языков мира на текущем этапе их развития наблюдается тенденция перехода лексического блендинга из разряда периферических к центральному способам словообразования. В частности, в английском и русском языках на протяжении последних десятилетий число лексических блендов неуклонно растет.

Характерной особенностью русского языка также является возникновение блендов-гибридов, что служит результатом языковых контактов. Бленды-гибриды объединяют в своей структуре разноязычные корреляты: исконную лексему русского языка и заимствованную лексему английского языка, которые формируют единое смысловое и концептуальное целое производной единицы.

Большая часть зафиксированных нами блендов-гибридов используется в сфере рекламы в виде или составе слоганов для привлечения внимания целевой аудитории. Так, в рекламной кампании производителя пива «Tuborg Green» применяются бленды-гибриды с англоязычным элементом названия продукции — лексемой «green»: *greendiозно* < *green* + *грандиозно*; *вечегreenка* < *green* + *вечеринка*.

Характер семантического взаимодействия коррелятов блендов-гибридов специфичен и во многом отличен от семантических взаимосвязей одноязычных коррелирующих лексем. В данном случае не наблюдается эндо- и экзотрических отношений между коррелятами бленда, связь между ними устанавливается за счет созвучности англоязычного элемента определенному отрезку русскоязычного элемента (Новый год *приноC'EED* подарки; «*AUDI*»енция) либо за счет внедрения англоязычного элемента в структуру русскоязычного, что обеспечивает графическое выделение и узнаваемость ссылки на продукцию (*LEDовое* шоу — LED-телевизоры как спонсоры шоу «Ледниковый период»).

Порождение блендов-гибридов происходит в результате концептуальной интеграции — взаимодействия двух исходных ментальных пространств, структуры которых проецируются на новое производное ментальное пространство, характеризующееся компактностью и емкостью (Turner and Fauconnier 1995). Значение бленда-гибрида не сводится ни к одному из образующих его пространств, ни к сумме их элементов, но сочетает их черты и тем самым становится уникальным.

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АККУРАТНОСТЬ МОДЕЛИРОВАНИЯ РЕФЕРЕНЦИАЛЬНОГО ВЫБОРА: ОЦЕНКА ЧИТАТЕЛЯМИ

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Референциальный выбор, то есть выбор наименования для референта в дискурсе, — это сложный когнитивный процесс. Существует множество исследований, посвященных автоматическому моделированию референциального выбора. В большинстве работ подобного рода за эталон принимаются те формы референциальных выражений, которые встречаются в тексте. Однако в последнее время этот подход вызывает критику со стороны сторонников человеческой оценки (human evaluation) результатов моделирования референциального выбора (Khan et al. 2009).

Нашей целью было описать методику оценки людьми результатов моделирования референциального выбора и также оценить результаты предсказания референциальных выражений, описанные в (Loukachevitch et al. 2011). Данное моделирование проводилось на материале корпуса RefRhet, размеченного по референции. Аккуратность выбора между полными ИГ и местоимениями составила 89,9% (для одного из алгоритмов). Аккуратность оценивалась как отношение верно предсказанных форм референциальных выражений к общему количеству маркабул. При этом верно предсказанными считались те референциальные выражения, форма которых совпадала с имеющейся в тексте.

Референциальный выбор зависит от активации референта в сознании (Chafe 1994, Kibrik

2011), при этом, согласно многофакторному подходу А.А. Кибрика, при определенном уровне активации одинаково возможно употребление как полной ИГ, так и местоимения (Kibrik 1996). Мы считаем, что этот факт очень важен при оценке аккуратности моделирования референциального выбора, поскольку в таком случае некоторые из выявленных традиционным способом ошибок алгоритма могут быть не ошибками, а допустимыми вариантами.

Для экспериментального исследования было отобрано 9 текстов из корпуса RefRhet длиной от 80 до 256 слов. В каждом из этих текстов было неверно предсказанное референциальное выражение (то есть форма, предсказанная алгоритмами, не совпадала с текстом корпуса). В исходном тексте это референциальное выражение было именем собственным, но три алгоритма (решающие деревья, логистическая регрессия и бустинг) предсказывали местоимение. В каждом из 9 текстов нами была произведена замена имени собственного на предсказанное местоимение. Все 18 текстов (с произведенной заменой и в исходном состоянии) были распределены по двум экспериментальным листам таким образом, чтобы на каждый лист попал только один из двух вариантов каждого текста и чтобы тексты с заменой и без чередовались.

Эксперимент проходил в режиме онлайн. Перед испытуемыми ставилась задача прочитать каждый из 9 текстов и ответить на вопросы к ним. Сначала на экране появлялся текст целиком, после того, как испытуемый переходил к ответу на вопросы, вернуться к тексту было нельзя.

К каждому тексту было задано по три вопроса с вариантами ответа (от 3 до 6 в зависимости от содержания текста), два из которых являлись фактографическими, а ответ на один из них был задан к референциальному выражению, точность предсказания которого мы хотели проверить (назовем эти вопросы экспериментальными).

В случае если это референциальное выражение действительно имеет активацию, при которой оно одинаково верно может быть выражено как полной ИГ, так и местоимением, не должно быть большого расхождения между процентом ошибок в ответах на фактографические вопросы и вопросы к проверяемому референциальному выражению в обоих экспериментальных листах (назовем их для краткости вопросами к местоимению и вопросами к имени собственному).

В качестве теста был проведен эксперимент на носителях русского языка, владеющих английским. В эксперименте приняли участие 28 человек, в возрасте от 16 до 31 года. Каждый

испытуемый ответил на 18 фактографических вопросов и 9 экспериментальных вопросов. Ответы 3 испытуемых были исключены из исследования, так как содержали более 40 % ошибок по фактографическим вопросам.

Правильность ответов на фактографические вопросы и на вопросы к именам собственным составила 81 %, в то время как правильность ответов на экспериментальные вопросы к местоимениям составила 73 %. При детальном анализе распределения ответов на вопросы стало ясно, что особую сложность для испытуемых представляли два вопроса к местоимениям, правильность ответов на которые была около 50 %. Если исключить эти вопросы из подсчета, то средняя правильность ответов на вопросы к местоимениям равна 79 %, что сопоставимо с уровнем правильности ответов на фактографические вопросы и вопросы к именам собственным.

Таким образом, необходимо детальное исследование тех случаев, когда замена имени собственного на местоимение осложнила понимание текста читателями. В то же время для 7 из 9 текстов предсказанная автоматически форма референциального выражения, которая отличалась от представленном в исходном тексте, не увеличивала процент ошибок в понимании текстов.

Помимо тестового эксперимента с русскоязычными испытуемыми, проводится более масштабный эксперимент с носителями английского языка. Также в планах проведение детального анализа паттерна ошибок каждого из испытуемых и различий в типах контекстов, где местоимения вызывают большое или умеренное количество ошибок.

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О РАЗЛИЧИЯХ МЕХАНИЗМОВ ОРГАНИЗАЦИИ МЕЖПОЛУШАРНОГО ВЗАИМОДЕЙСТВИЯ СИММЕТРИЧНЫХ И НЕСИММЕТРИЧНЫХ ОТДЕЛОВ КОРЫ

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Анализ организации межполушарного взаимодействия имеет важное значение для понимания механизмов центрального обеспечения высших психических функций и протекания процессов ВНД. Несмотря на значительный объем накопленных нейро- и психофизиологических данных, остается в решающей степени неясным, по каким закономерностям межкорковые и корково-подкорковые системы внутримозговой интеграции регулируют процессы организации системного взаимодействия различных областей коры левого и правого полушарий. В особой мере это касается гетеротопических межполушарных взаимодействий, которые в последнее время вызывают существенный интерес исследователей при изучении центральной организации вербально-мнестических функций и других видов когнитивной и мыслительной деятельности человека.

С целью уточнения роли различных интегративных систем в организации процессов координированного взаимодействия полушарий мозга у взрослых испытуемых ($n=30$), детей 8–9 лет ($n=12$), 5–6 лет ($n=15$), 3–4 лет ($n=10$) и у младенцев ($n=11$) было проведено исследование динамики кросскорреляционных связей биоэлектрических потенциалов коры обоих полушарий мозга с помощью оригинального метода выявления синхронно изменяющихся во времени межрегиональных связей ЭЭГ. Полученные результаты позволили говорить о выделении двух различных морфофункциональных систем конечного мозга, обеспечивающих принципиальные отличия в организации процессов межполушарного взаимодействия симметричных и несимметричных отделов коры. У взрослых испытуемых и у детей разного возраста это проявлялось в особенностях динамики межполушарных кросс-корреляционных связей ЭЭГ различных отделов коры обоих полушарий.

Так, изменения во времени уровня взаимокорреляции ЭЭГ билатерально-симметричных отделов коры отличались значительной независимостью как от текущих изменений

межполушарных (гетеротопических) связей ЭЭГ несимметричных отделов обоих полушарий, так и от динамики внутривнутриполушарных взаимодействий. В свою очередь, изменения уровней гетеротопических межполушарных взаимодействий различных зон коры протекали синхронно с динамикой внутривнутриполушарных взаимодействий в пределах ипсилатерального к данной определенной зоне коры полушария. Наиболее высокой скоррелированностью изменений характеризовались при этом «парные» дистантные взаимосвязи ЭЭГ данной зоны с активностью переднелобных отделов обоих полушарий. Наблюдалось одновременное нарастание или снижение дистантных связей ЭЭГ переднелобных отделов как левого, так и правого полушария с данной зоной коры, без выраженной синхронизации их изменений с динамикой межполушарных взаимодействий самих переднелобных отделов полушарий.

Такой феномен одновременного «сканирования» различных отделов неокортекса со стороны фронтальных отделов обоих полушарий устойчиво выявлялся как у взрослых испытуемых, так и у детей, начиная с младенческого возраста. Подобный тип парных синхронных взаимодействий с отдельными зонами коры был выявлен и для теменных, и для затылочных отделов обоих полушарий, однако со значительно меньшей степенью синхронизации их ипсилатеральных связей ЭЭГ с данной зоной коры. Таким образом, полученные результаты показывают, что парные дистантные взаимодействия переднелобных отделов обоих полушарий с любой из зон коры изменяются во времени с наиболее высоким уровнем синхронности по сравнению с парными взаимодействиями с этой зоной других симметричных областей обоих полушарий. Динамика такого непрерывного «сканирования» отдельных зон коры со стороны фронтальных отделов обоих полушарий протекает с характерным для каждой из «сканируемых» зон ритмом флюктуаций, отличающимся в определенной степени от ритмов, с которыми изменяются парные взаимодействия этих отделов с другими областями коры.

Если в организации межполушарных взаимодействий билатерально-симметричных отделов коры больших полушарий роль комиссуральных путей конечного мозга, особенно мозолистого тела, не вызывает сомнений, то

организация системного взаимодействия несимметричных отделов полушарий не имела однозначного объяснения. Анализ полученных данных позволяет полагать, что изменения уровня гетеротопических межполушарных взаимодействий любой из зон коры осуществляются через волоконные пути таламо-фронтальной и таламо-париетальной систем корково-подкорковой интеграции, протекая синхронно с изменениями уровня внутриполушарных взаимодействий в пределах ипсилатерального к данной зоне коры полушария. В организации таких процессов парной деятельности полушарий с ранних периодов постнатального развития мозга ребенка выявляется особая роль фронтальных отделов полушарий.

Выявляемые выраженные различия в динамике межполушарных взаимодействий билатерально-симметричных и несимметричных отделов коры устойчиво проявляются на разных стадиях постнатального онтогенеза, начиная с младенческого возраста, что позволяет обоснованно полагать наличие двух различных механизмов системной организации процессов межполушарной интеграции, обеспечивающих на основе деятельности различных межкорковых и корково-подкорковых интегративных систем принципиальные отличия в организации системного взаимодействия симметричных и несимметричных отделов коры левого и правого полушарий головного мозга.

Организация процессов взаимодействия билатерально-симметричных отделов коры обоих полушарий, по-видимому, реализуется через комиссуры конечного мозга, в особой мере – через корпус каллоzum, что обеспечивает синхронизацию динамических изменений межполушарных взаимосвязей активности относительно близко расположенных в каждом из полушарий симметричных отделов коры,

межполушарные взаимосвязи которых реализуются через анатомически одноименные отделы мозолистого тела (коллено, тело или сплениум), придавая тем самым их динамике топологическое своеобразие. При этом изменения во времени степени межполушарного взаимодействия симметричных отделов коры отличаются значительной независимостью от динамики внутримушарных связей ЭЭГ и межполушарных гетеротопических взаимодействий, синхронность изменений которых осуществляется на основе деятельности другого механизма.

Морфофункциональная организация этого механизма межполушарной интеграции отличается существенно более сложным строением: реализация дистантных взаимосвязей активности несимметричных отделов полушарий, очевидно, осуществляется на основе координированного взаимодействия межкорковых и корково-подкорковых ассоциативных систем, включающих длинные волоконные пути в пределах каждого из полушарий и таламо-кортикальные ассоциативные взаимосвязи. При этом текущие изменения гетеротопических взаимодействий в высокой степени согласованы с динамикой внутримушарных связей отделов коры либо левого, либо правого полушария. Существенно, что с ранних периодов постнатального онтогенеза в организации таких системных процессов парной деятельности больших полушарий выявляется особая роль фронтальных отделов коры левого и правого полушарий.

У младенцев, согласно полученным данным, отмечается опережающее становление механизмов организации гетеротопических межполушарных взаимодействий, что указывает на их особую роль в формировании когнитивной и мыслительной деятельности человека на ранних этапах онтогенеза.

СТРУКТУРА И МЕХАНИЗМЫ НАРУШЕНИЙ МЫШЛЕНИЯ ПРИ ШИЗОФРЕНИИ В СВЕТЕ ИНФОРМАЦИОННОЙ ТЕОРИИ ПСИХИКИ Л. М. ВЕККЕРА

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Исследования патологии, наряду с другими перспективными методологическими подходами нейрокогнитивной науки (онтогенетическими,

психогенетическими, аниматными и др.), играют незаменимую роль в изучении нейropsychологических механизмов познания (Lezak, Howieson 2004; Величковский 2006). Экспериментальные исследования нарушений мышления при шизофрении важны для понимания структурно-операционных и мозговых основ мыслительных процессов. Эти исследования показывают, что дихотомические (позитивно-негативные)

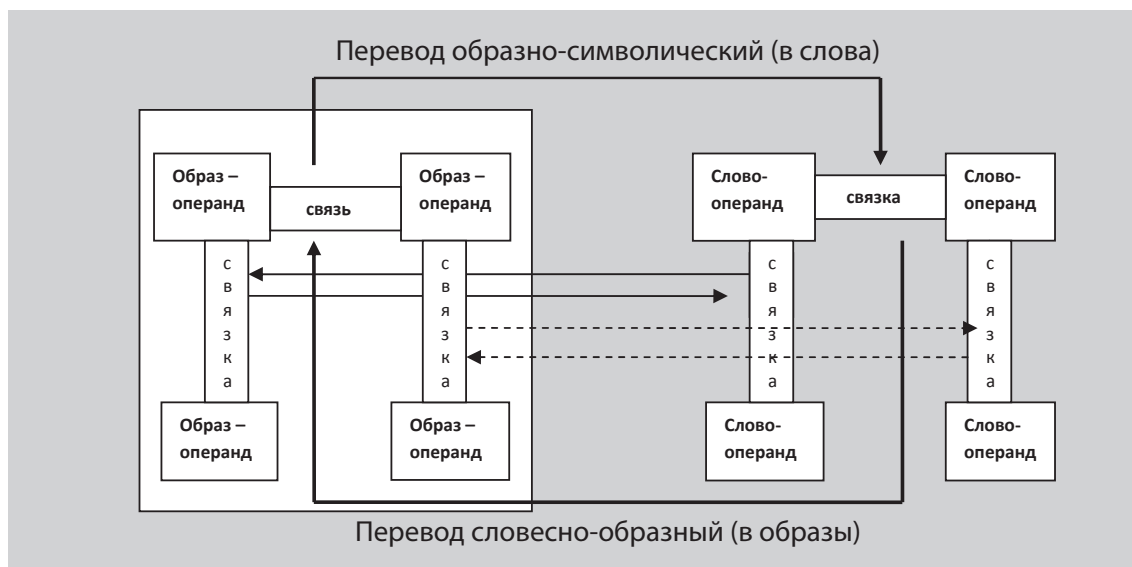


Рис. 1 Структурная формула понятийной мысли в информационной модели: вертикальные связи образуют родовидовые или понятийные отношения между операндами; горизонтальные – все другие.

(Andreasen 1986), трехмерные (обеднение, дисрегуляция, дезорганизация) (Liddle et al. 2002) и даже пяти- (Harrow, Quinlan 1985; Holzman, Shenton, Solovay 1986) или шести-факторные модели (Peralta et al. 1992), построенные на основе «факторной индукции» (Cuesta, Peralta 1999), не могут выйти за пределы линейной упорядоченности различных векторов патологии мысли. И даже их формально-математическая иерархия не решает проблем психологического обоснования структуры мышления. При этом многочисленные теории, объясняющие психологические и нейропсихологические механизмы мыслительных расстройств, как показывает широкий обзор литературы (Чередникова 2011а; 2011б), если не противоречат друг другу, то конкурируют между собой. Здесь необходима теория, которая могла бы непротиворечиво объединить их все и объяснить патофизиологию мышления при шизофрении в рамках целостной психологической концепции.

На наш взгляд, такой теорией является фундаментальная информационная теория психики, в рамках которой едиными принципами организации информационных процессов объединены не только элементарные процессы приема и переработки информации на сенсорно-перцептивном уровне, но и мышление, интеллект и все другие психические процессы. Иерархическая информационная теория Л. М. Веккера (1974, 1976), которая представляет мышление как взаимно обратимый перевод отношений между операндами с языка образов на язык слов, указывает, по крайней мере, 8 основных видов

структурных нарушений. Схема структурной формулы понятийной мысли в информационной модели может быть представлена так (см. рис. 1).

Эта модель дает возможность предположить следующие нарушения структурных компонентов мышления: 1) расстройства самих операндов мысли – образов и слов; 2) расстройства устанавливаемых операторами структурных связей – горизонтальных и вертикальных (обобщающих, родовидовых – понятийных); 3) расстройства инвариантного обратимого взаимоперевода всех отношений между операндами с языка образов на язык слов.

Эксперимент. Предсказания этой модели были проверены в факторно-аналитическом исследовании нарушений мышления при шизофрении в выборке из 170 пациентов (114 мужчин и 56 женщин) с психиатрическими диагнозами, установленными согласно МКБ-10 (F20.0; F20.6; F25; F21) – соответственно параноидной (64 человека) и простой (38) шизофрении, шизоаффективного расстройства (33) и шизотипического расстройства личности (35). **Метод.** Использовалась батарея из 8 тестов мышления, среди них – известные вербальные и невербальные методики, например «Исключение лишнего слова», «Классификация предметов», «Пиктограммы» и др. **Система оценивания.** Была разработана авторская система оценивания нарушений мышления (34 параметра). Надежность измерений по этой методике была подтверждена наличием достоверных ($p < 0,05$ – $p < 0,01$) межэкспертных корреляций

(,426 – ,992 – по критерию Пирсона) у четырех независимых экспертов. *План исследования.* В исследовании варьировались различные параметры данных с целью выявить побочные эффекты объема выборки, набора параметров и тестов, а также состава экспертов на результаты факторного анализа. *Результаты.* В итоге в каждой из пяти разных процедур факторного анализа (методами выделения главных компонент и варимакс-вращения) было выделено от 8 до 12 относительно независимых факторов, которые получили названия согласно параметрам с наибольшей факторной нагрузкой. Среди них структурным нарушениям мышления, предсказанным исследуемой моделью, соответствовали 9 факторов: *Нарушения зрительных образов, Псевдоабстрактность образов, Схематизм образов, пиктограммы, Абстрактность вербальная, Неологизмы, Формализм, Некоррегируемость/Амбивалентность, Алогизм, Резонерство.* Еще 4 фактора соотносились с интеллектуальными (*Снижение понятийного индекса*), регуляторными (*Интеграция/Планирование*), коммуникативными (*Претенциозность*) и динамическими (*Стереотипии*) нарушениями мышления. *Выводы.* Результаты факторного исследования подтвердили двуязычный (вербально-образный) характер нарушений мышления и наличие предсказанных информационной моделью структурных расстройств: операндов – нарушения зрительных образов и слов (Неологизмы – лексико-семантические нарушения и Формализм – отрыв звукового образа и грамматических

характеристик слова от его семантики); операторов горизонтальных (Алогизм) и вертикальных (Псевдоабстрактность образов, вербальная Абстрактность, Парадигмальное резонерство) связей; механизмов взаимнообратимого перевода – Некоррегируемость/Амбивалентность/контаминации/символизм). Была выявлена также относительная независимость факторов структурных нарушений мышления от факторов нарушения регуляции, динамики, интеллектуальных и коммуникативных расстройств мышления.

Заключение. Эти результаты во многом соответствуют данным зарубежных исследователей [Holzman, Shenton, Solovay, 1986; Peralta, Cuesta, 1992; Cuesta, Peralta, 1999 и др.], которые использовали другие методы (тест Роршаха, интервью) и системы оценивания. Информационная модель мышления Веккера может объяснить смысл полученных в разных исследованиях факторов и согласовать различные причинные обоснования расстройств мышления. Все они по-своему соотносятся с закономерной структурной сложностью, иерархичностью и системностью информационной организации мышления, отвечающей современным представлениям о широком индивидуальном разнообразии и гетерогенности нарушений мышления, а также о гетерогенности и иерархической многомерности системных расстройств мозга при шизофрении (Andreasen, Carpenter, 1993; DeRosse et al., 2008; Tandon, Keshavan, Nasrallah, 2009).

ОСОБЕННОСТИ УСТАНОВКИ НА СЕРДИТОЕ ЛИЦО У ДЕТЕЙ ПРЕДШКОЛЬНОГО ВОЗРАСТА

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Правильное и быстрое опознание эмоционального выражения лица, негативного или позитивного, в существенной мере определяет взаимоотношения между людьми. Изучению факторов, определяющих способность к опознанию и интерпретации лицевой экспрессии, а также мозговых механизмов, обеспечивающих организацию этих функций, посвящено множество психофизиологических работ. Относительно скромное место среди них занимают онтогенетические исследования. Между тем, они могут быть весьма ценными

для выяснения одного из центральных вопросов: с формированием каких структурно-функциональных образований головного мозга связана у человека эволюция функции опознания лицевой экспрессии. Согласно нейрофизиологическим и нейроморфологическим исследованиям, от 4–5 к 7–8 годам происходит существенное прогрессивное преобразование нейронной организации коры больших полушарий, приводящее к значительным изменениям когнитивных процессов детей (Фарбер Д. А., 2009), в том числе и в восприятии лиц (Henderson et al., 2003). Исследования детей разного возраста позволили судить о роли прошлого опыта в опознании и правильной или неправильной оценке эмоционального выражения лица (Lewis et al., 2007). Было показано, что

дети из благополучных (ласковые родители) и неблагополучных (сердитые, агрессивные родители) семей по-разному оценивают выражение одного и того же лица (Pollac S, Sinha P., 2002). У последних обработка информации при экспозиции лица с сердитым или угрожающим выражением происходит существенно быстрее. Они легче составляют мнение (гипотезу) об отрицательных чувствах, испытываемых другими людьми, на основе меньшей информации, по сравнению с детьми из благополучных семей, но обнаруживают явный дефицит в дифференцированной, тонкой оценке лицевой экспрессии.

Для изучения функции опознавания эмоционального выражения лица мы применили метод формирования установки Д.Н. Узнадзе. Обследовали 22 детей (9 девочек и 13 мальчиков) дошкольного возраста от 5,1 до 6,6 из детского сада № 1826 г. Москвы. Родители детей дали письменное согласие на исследование. Перед основным тестом с ребенком играли в «Азбуку настроений» (Белоцерковская Н.Л., 2008), чтобы узнать степень развития его эмоциональной сферы. Все дети правильно опознавали «знак» эмоций людей и животных, нарисованных на картинках. Для формирования установки были использованы изображения лица взрослого человека на темно-сером фоне, взятые из атласа (Ekman, Frisen, 1976). На стадии формирования установки изображения предъявлялись 15 раз одновременно на двух кадрах – слева с сердитым (хмурым, насупленным, но не агрессивным) выражением лица, справа – лицо того же человека с нейтральным, спокойным выражением. На стадии тестирования установки 30 раз также одновременно предъявлялись два кадра с нейтральным выражением. В течение всего обследования записывалась ЭЭГ.

Большинство детей (18 человек) усваивают инструкцию и правильно опознают лицо с сердитым выражением при формировании установки. На стадии тестирования все дети в том или ином числе проб ошибаются в оценке лицевой экспрессии. У 16 формируется устойчивая установка на восприятие сердитого лица (6–30 ошибок). При этом в подавляющем большинстве наблюдаются т.н. ассимилятивные иллюзии: ребенок определяет как неприятное лицо в том месте парного стимула, где на стадии формирования установки было лицо с сердитым выражением. При разделении возраста по медиане (6,01 лет) показано, что младшие дети значительно чаще допускают ассимилятивные ошибки, чем старшие (22 и 12 ошибок в среднем соответственно; $U=17, p<0,04$). Ассимилятивные

иллюзии объясняются прайминг-эффектом, т.е. имплицитной формой памяти, когда оценка нейтрального лица соответствует той лицевой экспрессии, которая воспринималась субъектом ранее (Stappell D., Koomen W, 2006). Авторы работы подчеркивают, что этот эффект возникал автоматически, без участия сознания.

Анализ пространственной синхронизации предстимульной тета- и альфа-активности биопотенциалов у дошкольников показал наличие отдельных связей между отведениями ЭЭГ, не образующих структуры, как это наблюдалось у детей более старшего возраста (Костандов Э.А., Фарбер Д.А., 2010). Это может служить основанием для вывода о том, что у детей 5–6 лет еще не сформированы в достаточной степени механизмы участия кортико-гиппокампальной и фронто-таламической систем мозговой интеграции в обеспечении пластичности формирующихся когнитивных установок. Существуют данные о незрелости фронто-таламической регуляторной системы у детей этого возраста (Фарбер Д.А., 2009; Мачинская Р.И., 2006). Можно предположить, что при сформировавшейся у детей дошкольного возраста установке незрелая фронто-таламическая система, как система управляющего контроля, ответственна за низкую эффективность распознавания эмоций, а ее созревание ведет к способности ребенка быстро переходить от ошибочного восприятия лицевой экспрессии к правильному.

Наше исследование показало, что не следует формировать у детей, особенно до 6-летнего возраста, установки на эмоционально-негативное выражение лица, постоянно хмуриться и сердиться по пустякам. Однажды они начнут воспринимать вас не так, как этого бы вам хотелось. Тем более что формируется эта установка значительно дольше, чем у взрослых, и время, чтобы улыбнуться и найти понимание, еще есть.

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О ВОЗМОЖНОЙ ИНТЕРПРЕТАЦИИ ПОНЯТИЙ ИНТУИЦИИ, ПОДСОЗНАНИЯ И ЛОГИКИ НА ЯЗЫКЕ НЕЙРОКОМПЬЮТИНГА

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Понятия *интуитивного* и *логического* (равно как *сознания* и *подсознания*), несмотря на их популярность, остаются дискуссионными, а механизмы этих типов мышления остаются в центре внимания и научного интереса. Существует множество описаний этих понятий, которые трудно отнести к четким определениям. Мы будем опираться, с одной стороны, на подход Канта, где интуиция есть *прямое усмотрение истины*, а критерием правильности признается лишь внутреннее удовлетворение. С другой стороны, исходя из этимологии термина *логика* (*logos* = слово, мысль), примем «усредненное» понимание логики как «словесного рассуждения, базирующегося на общепринятых причинно-следственных связях». В данной работе предлагается интерпретация этих понятий на языке нейрокомпьютинга и обсуждаются механизмы, лежащие в их основе.

«Естественно-конструктивистский» подход к моделированию мышления, развиваемый в наших работах (см. Чернавская и др., 2009, 2011 и ссылки там же), базируется на нейрокомпьютинге, динамической теории информации и теории распознавания. В рамках данного подхода *мыслительная система* представляется в виде системы связанных *нейропроцессоров* – пластин, населенных *формальными нейронами* (бистабильные элементы, которые могут существовать стационарно либо в активном, либо в пассивном состоянии). Рассматриваются два типа процессоров: Хопфилда (аддитивная ассоциативная сеть, далее *X*) – для операций

с образной информацией; Гроссберга (нелинейное подавляющее взаимодействие нейронов) – для формирования внутренних символов. Информация хранится в виде *обученных* (модифицированных в результате внешнего сенсорного воздействия и/или эволюции системы) *связей*.

Под мышлением мы понимаем *самоорганизующийся процесс записи, хранения, обработки, генерации и распространения информации*. Ранее (см. Чернавская и др., 2011) были проанализированы элементы, необходимые для выполнения всех упомянутых функций. Было показано, что в результате самоорганизации системы возникают (*последовательно!*) уровни информации *разного типа*. Перечислим их кратко.

1. Первичные образы (О): вся образная информация – все сигналы от рецепторов записываются как *цепочки активированных нейронов (образы)* на пластине *X*. Связи нейронов обучаются при предъявлении объектов так, что объекты, предъявленные однократно, записываются слабыми («серыми») связями. Чем чаще активируется образ, тем сильнее («чернее») связи. Функция уровня: *запись «чувственной» информации*.

2. Образная информация, отобранная для хранения, или типичные образы (ТО) – пластина типа *X*, воспринимающая только образы, записанные достаточно сильными («черными») связями. Функция: *сохранение выбранной информации*; связи нейронов обучаются по принципу *фильтрации ненужного*.

3. Символьная (семантическая) информация: символы (С), сформированные на основе типичных образов, несут семантическую нагрузку, т.е. *осознание* того факта, что данная

цепочка активных нейронов описывает один реальный объект. На этом же уровне находятся и стандартные символы, или *символы-слова (СС)*, воспринятые извне для обозначения тех же *конкретных* объектов. Функции: *кодирование*, обеспечение взаимодействия пластин (после формирования межпластинных связей символа с его образом *С «ТО»*), т.е. *обработка информации и осмысленность* процесса.

4. Абстрактная (вербализованная) информация: Инфраструктура символов *С, СС* и их связей *С»С* и *С»СС*, не опосредованных образами, т.е. нейронами-прародителями пластин *Х*. Такой тип информации мы называем *абстрактной*: она не ассоциируется с конкретными объектами, а возникает в обученной системе как результат взаимодействия всех пластин (не «чувственное», а «выводное» знание). Функция: *коммуникация* с аналогичными системами («объяснять словами») и собственное *осознание*.

Итак, имеется 4 основных элемента: *О, ТО, С, СС* и связи между ними. Кроме этого, существует 5-й элемент: случайное (само)возбуждение (*шум*), обеспечивающее *перемешивающий слой* для генерации новой информации или активации труднодоступной. Природу шума в мышлении человека естественно связать с *эмоциями* (см. Чернавская и др., 2009). Первые 3 информационных уровня представляют собой *служебную*, или «*внутреннюю*» (индивидуальную) информацию данной системы, «вещь в себе». Только последняя, вербализованная, информация является *осознанной* в общепринятом смысле (не только индивидуально). Именно этот уровень, по-видимому, имеется в виду, когда говорят «вывести на уровень *сознания*».

Переход от каждого предыдущего уровня к последующему сопровождается *потерей* части накопленной информации – точнее, она остается на предыдущем уровне и не попадает далее. Так, слабые «серые» связи (их роль в том, чтобы хранить «случайную» информацию, которая когда-то может оказаться важной) не переходят на уровень *ТО* и поэтому не могут ассоциироваться ни с каким символом – эта информация оказывается *не осознанной и не подконтрольной* системе. Такая цепочка может активироваться только благодаря шуму («вдруг увидеть внутренним взором»). Этот акт можно интерпретировать как *озарение* («*insight*»), а сами «серые» связи – как *подсознание*.

При переходе *С→СС* от семантической информации к вербализованной остается

множество символов, для которых стандартных слов не существует, – это некие цельные «картинки», описание которых требует декомпозиции, т.е. один внутренний символ может быть описан при помощи многих слов. Вербализация этой информации требует не *озарения*, а подбора нужных слов (связей).

Таким образом, *скрытая* информация имеет разные уровни глубины, что существенно влияет на усилия по ее извлечению на уровень *сознания*. **Выводы, основанные на скрытой информации**, естественно интерпретировать как *интуитивное* мышление.

К *логическому* мышлению естественно отнести оперирование *вербализованными понятиями и абстрактными связями*, причем лишь теми, которые *считаются установленными* в данном социуме. Абстрактная информация имеет собственные уровни и инфраструктуру, которая нарабатывается постепенно, по мере эволюции системы («с годами»); *всю* развитую инфраструктуру можно ассоциировать с *мудростью*.

Специфика элементов наиболее ярко проявляется при решении задач, связанных с определением сходства/различия объектов. Такие задачи решаются на уровне образных подсистем *автоматически*: сходство определяется общими нейронами, различие – разными, и система это *знает*. Однако это знание *не осознано*, пока общие/разные нейроны не выражены через комбинации внутренних символов – тогда *служебно-образное* знание может перейти в *семантическое*. Последующая *вербализация* знания означает выстраивание абстрактных связей *С»СС* внутренних символов со словами. Полученный ответ верен для данной системы (индивида), но может быть ошибочен объективно, поскольку способ записи образной информации индивидуален. Решение, полученное таким образом, интуитивно: оно основано на опыте, т.е. картине мира индивида, и не должно доказываться. Однако вербализованное решение *может быть доказано*, если для этого использовать *общепринятые* понятия и связи – по сути, это и есть метод «перевода интуитивного знания в логическое».

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О КОНСТРУКЦИИ АППАРАТА МЫШЛЕНИЯ И ЕЕ ВОЗМОЖНЫХ МОДИФИКАЦИЯХ

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Доклад является продолжением и развитием работ (Чернавский и др., 2011; Чернавская и др., 2011), цель которых – представить возможный механизм работы Аппарата Мышления (далее *АМ*), его структуру и функции на основе теории распознавания, нейрокомпьютинга и динамической теории информации (Чернавский, 2001). Такой подход (называемый «естественно-конструктивистским») отличается от традиционного (принятого в нейрофизиологии). В рамках традиционного подхода детально изучаются свойства элементарных объектов (нейронов), включая характеристики взаимодействия одного нейрона с другими; межнейронные связи как *самостоятельный* объект при таком рассмотрении не выделяются. В нейрокомпьютинге, напротив, нейроны и связи рассматриваются как отдельные объекты, со своими свойствами. Утрируя, можно сказать, что в нейрофизиологии детально изучаются «кирпичи», из которых построено «здание», т.е. *АМ*; вопрос о конструкции, архитектуре и назначении самого здания остается в стороне. В нейрокомпьютинге же основной вопрос, стоящий перед исследователем: какова конструкция *АМ* и как она выполняет заявленные функции; при этом свойства нейронов («кирпичей») сильно упрощаются.

Представим краткий перечень основных положений развиваемой нами концепции.

Конструкция *АМ* состоит из блоков нейпроцессоров, выполняющих *определенные функции*, а именно – *распознавание* объектов, *прогноз* (распознавание *процесса*, т.е. временной последовательности образов изменяющегося объекта), преобразование образа в символ (*кодирование*), *декомпозиция* символа в образ, *интеграция символов* посредством образования символа более общего характера на другом уровне иерархии.

Для обеспечения этих функций в *АМ* должны входить:

(1) нейпроцессор, воспринимающий и запоминающий образы всех объектов, наблюдавшихся в течение времени обучения (*первичные образы*, или «размытое множество»);

(2) нейпроцессор, содержащий целевые множества *типичных образов* (образная информация, отобранная для хранения);

(3) блоки преобразования образов в их символы (включая проверку этой процедуры);

(4) блоки интеграции символов.

Предполагается, что в конструкции *АМ* имеет место *копирование* блоков с сохранением свойств нейронов и обученных связей, в которых уже сформированы однозначные алгоритмы упомянутых выше операций в упрощенном виде, т.е. без проведения дополнительной проверки.

Показано, что организованная подобным образом конструкция может решать следующие задачи:

- принятие решений при наличии необходимой и достаточной информации;
- принятие решений при недостатке информации;
- создание новой информации, например, когда существующая информация противоречива (разрешение *логических парадоксов*).

Предлагаются и обсуждаются *возможные варианты модификации АМ* и решения ряда принципиально важных для конструкции *АМ* проблем.

1). Анализируется механизм работы подсистемы из нескольких процессоров, содержащих *целевые множества*. Последние возникают в *АМ* в ходе решения конкретных задач, связанных с определенной *целью*. Особенность задачи состоит в том, что такие множества сначала формируются (когда цель поставлена), существуют определенное время (пока цель не достигнута), исчезают, стираются или заменяются другими (после достижения цели). Здесь следует предполагать наличие некоего аналога таймера, реализованного в обычных числовых компьютерах. Время существования может быть как малым (при постановке локальных, быстро преходящих целей), так и очень большим (если цель, например, профессиональная деятельность).

2). Рассмотрен один из возможных механизмов обучения *АМ* восприятию и *воспроизведению речи*. Предполагается, что обучение происходит с «учителем», владеющим общепринятым языком. «Учитель» одновременно предъявляет *АМ* образ объекта и его название, причем последнее происходит посредством слуховой сенсорной системы. При этом название объекта

(слово) воспринимается не как его символ, а как один из признаков наряду с другими свойственными ему признаками (формой, цветом, запахом и т.п.). Различие между ними состоит лишь в том, что название – условный признак, а другие перечисленные – объективны. Информация о признаках, полученных из разных сенсорных систем, обрабатывается независимо. В результате возникает символ названия. При интеграции информации возникает «полный» символ образа объекта, содержащий все признаки, включая и название.

Для воспроизведения названия в виде последовательности звуков необходимо провести обучение действию эффекторной системы (голосовых связок). Этот процесс аналогичен обучению *действиям* (стоять, ходить, плавать и тому подобным умениям) и рассматривался в монографии Чернавский и др. 2004. Он включает многократное сравнение воспроизведенного слова с исходным и коррекцию процесса обучения эффекторной системы. При достижении удовлетворительного сходства процесс обучения запоминается как однозначный алгоритм воспроизведения символа образа объекта по его названию и воспроизведению названия по символу. После этого *АМ* может воспринимать

слова, придавать им смысл (т.е. воспроизводить по ним образ объекта) и сообщать их другим *АМ* через общую среду – колебания воздуха. Подчеркнем, что все символы, возникающие внутри данного *АМ*, индивидуальны; универсален в данном социуме лишь *результат обучения эффекторной системы*.

3). Кратко обсуждаются еще не решенные проблемы, в частности, перечисляются *возможные дефекты АМ* и их внешние проявления.

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ЛЕКСИЧЕСКАЯ НЕОДНОЗНАЧНОСТЬ И ОРГАНИЗАЦИЯ МЕНТАЛЬНОГО ЛЕКСИКОНА

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Большинство исследователей (Hillis 2000, Aitchison 2003 (1987) и др.) выделяют в ментальном лексиконе, как минимум, два уровня, которые в наиболее общем виде можно обозначить как *уровень формы* и *уровень значения*. Уровень формы, в свою очередь, может быть разделен на два подуровня: звуковых и (орфо)графических (орфографических) форм (Hillis 2000, Bonin 2003 и др.). Лексически неоднозначным фрагментам речевого сигнала соответствуют единицы ментального лексикона, имеющие одно представление на уровне формы и несколько представлений на уровне значения, которые могут быть как взаимосвязанными (многозначность), так и независимыми (омонимия). Кроме того, при восприятии устной речи неоднозначными оказываются единицы, совпадающие только по звучанию, но

различающиеся написанием (омофоны), а при восприятии письменной речи, напротив, – совпадающие по написанию, но различающиеся звучанием (омографы). Для моделирования механизмов восприятия речи, предполагающих поиск соответствий отрезкам речевого сигнала в ментальном лексиконе слушающего/читающего, необходимо описать внутреннюю структуру единиц лексикона, имеющих несколько интерпретаций, а именно определить, равноправны ли эти интерпретации, и если нет, то за счёт каких факторов одни значения получают преимущество над другими.

Эксперимент 1. Исследовалось восприятие многозначных слов носителями русского языка методом регистрации движений глаз. Проверялась рабочая гипотеза, согласно которой на время обработки многозначного слова влияют сразу несколько факторов: относительная частотность значения (структура слова), тип значения (прямое/переносное) и тип разрешающего контекста (предшествующий/последующий). *Методика.* В основу дизайна легли

исследования (Frisson & Pickering, 1999; 2001). Эксперимент проводился на аппарате Eyegaze Analysis System. Испытуемым (28 человек) предъявлялись предложения с многозначными словами, каждое из которых выступило в 4-х вариантах (варьировались тип значения многозначного слова и тип разрешающего контекста); всего было отобрано 12 многозначных слов (напр.: 1. Совсем внезапно небо покрылось черными тучами и начался ливень, в результате мощный *град* обрушился на него; 2. Мощный *град* обрушился на него неожиданно, так как совсем внезапно небо покрылось черными тучами и начался ливень; 3. Мощный *град* обрушился на него неожиданно, со всех сторон на мальчика летели упрёки, обвинения и жесткая критика; 4. Со всех сторон на мальчика летели упрёки, обвинения и жесткая критика, мощный *град* обрушился на него неожиданно). Задачей испытуемого было читать предложения; время чтения слайдов не ограничивалось. Данные записывались и анализировались при помощи программы NYAN. Результаты эксперимента показали, что решающим фактором при выборе значения многозначного слова является его структура: порядок активации значений слова определяется их относительными частотностями (чем выше частотность значения, тем быстрее оно активируется). Тип значения слова не оказывает влияния на время его обработки. Наличие предшествующего контекста, как правило, увеличивает скорость чтения предложения в целом, но не оказывает непосредственного влияния на обработку многозначного слова, т. е. влияние контекста относится к поздним осознаваемым стадиям обработки слов, в то время как частотность значений слова – к ранним, автоматическим.

Эксперимент II проверял роль частотности значений при анализе речевых ошибок (более 200 примеров) письменной коммуникации – объявлений, записок, электронной переписки. Анализ показал, что выбор значения слова в первую очередь происходит на основе его структуры и только затем учитывается контекст; более того, это происходит даже в тех случаях, когда читающему заранее известно, что слово употреблено в другом (менее частотном, но более уместном) его значении (напр., «Ты знал, что бывают двухъядерные атомы? Я про процессоры»; «У кого-нибудь есть машина времени? группа т. е.»). Несмотря на то, что читающему известно нужное значение слова и выбор делать нет необходимости, осуществляется доступ и к другим значениям – с очень высокой относительной частотностью).

В Эксперименте III оценивалась роль фактора частотности при интерпретации лексически неоднозначного фрагмента речевого сигнала при восприятии омофонов. Проверялась гипотеза о влиянии степени соответствия между произнесением и написанием на выбор интерпретации. В качестве материала были использованы лексические омофоны – существительные в форме Им. п. ед. ч., заканчивающиеся на глухой согласный. Были подобраны пары двух видов: *вариант 1*: омофон, орфографическая запись которого ближе к произношению, является более частотным, чем второй омофон данной пары (например, /kot/ком–код); *вариант 2*: омофон, орфографическая запись которого ближе к произношению, является менее частотным, чем второй омофон данной пары (например, /prut/прут–пруд). Испытуемым предъявлялись для прослушивания изолированные слова, извлеченные из предложений, прочитанных двумя дикторами. Одна группа испытуемых (50 человек) должна была просто записать услышанное, вторая (35 человек) должна была составить любую фразу с каждым стимулом.

Результаты распознавания большинства стимулов обеими группами испытуемых подтверждают первостепенную роль частотности словоформ при осуществлении выбора между омофонами. Количество ответов, содержащих разные омофоны, достоверно не различается в тех случаях, когда оба члена пары встречаются в речи с равной частотой (/stok/, /mak/). При этом в ответах на стимул /stok/ преобладает тот вариант, написание которого ближе к произношению, что может свидетельствовать о предпочтении испытуемыми стратегии, опирающейся на соответствие между произнесением и написанием в том случае, когда омофоны близки по частотности.

Таким образом, все проведенные эксперименты показали, что интерпретации (значения) лексически неоднозначных фрагментов речевого сигнала являются неравноправными. Преимущество получают более частотные из них, причем их активация в процессе восприятия речи происходит, по-видимому, автоматически. Влияние контекста и других характеристик внутренней структуры неоднозначных словоформ проявляется лишь на более поздних стадиях обработки речевого сигнала.

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ЭВОЛЮЦИОННАЯ ЭПИСТЕМОЛОГИЯ О РАЗВИТИИ КОГНИТИВНЫХ СТРУКТУР

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Предметом эволюционной эпистемологии является эволюция когнитивных структур, механизмы роста знания, познание, понимаемое как функция развития, функция жизни. В таком контексте эволюционная эпистемология представляет одновременно «биологизацией эпистемологии» и «эпистемологизацией биологии», новой междисциплинарной коммуникацией науки и философии.

Основоположником этого направления считают австрийского биолога К. Лоренца, нобелевского лауреата по медицине и физиологии за 1973 год. Фундаментальное значение для эволюционной теории приобрели его работы «Кантовское учение об априорном в свете современной биологии» и «Оборотная сторона зеркала». Исходным моментом исследований является сформулированное еще И. Кантом положение об априорных формах рассудка. Согласно априоризму разум отнюдь не «чистая доска», человек подходит к явлениям с определенными формами созерцания и мышления, с помощью которых упорядочивает явления.

Откуда происходят априорные формы? К исследованию этой гносеологической проблемы обращается эволюционная теория познания, как отмечал К. Лоренц (Лоренц К. Кантовская концепция априори//*Эволюция. Язык. Познание*. М. 2000. с. 19), априори базируется на центральной нервной системе, которая столь же реальна, как и вещи внешнего мира, чью феноменальную форму оно (априори) задает для нас. Понимая познание как естественноисторический процесс, мы вписываем когнитивный опыт в эволюционный процесс. Тогда когнитивные структуры, априорные для индивида, оказываются апостериорными для вида. Суть эволюционной эпистемологии он выразил следующим образом: наши познавательные способности есть достижение врожденного аппарата отражения

мира, который был развит в ходе родовой истории человека и дает возможность фактического приближения к внесубъективной реальности.

Существенный импульс дальнейшего развития направление получило в более поздних работах У. Матураны и Ф. Варелы. Становление нового направления было связано с ориентацией на исследование реального познавательного процесса средствами эволюционного естествознания, прежде всего, биологии. Целью эволюционной эпистемологии является исследование биологических предпосылок познания и объяснение его особенностей на основе современных эволюционных воззрений. Эволюционная эпистемология, в отличие от классической эпистемологии, стремившейся (умозрительно) создать идеальную модель познания, обратилась к исследованию реальных процессов познания.

Всякая теория познания имеет в качестве основания систему онтологических представлений. Эволюционная эпистемология также опирается на важнейшие для нее философские предпосылки. Представим их в формулировке Г. Фоллмера. Важнейший постулат обозначается термином «гипотетический реализм», согласно которому: имеется реальный мир, независимый от восприятия и сознания. Постулат структурности – реальный мир структурирован, между всеми областями действительности существует связь и сами упорядочивающие принципы реальны и объективны. Постулат взаимодействия – наши чувственные органы аффицируются реальным миром. Постулат объективности – научные высказывания должны быть объективными в смысле соответствия с действительностью.

Все выше сказанное характеризует эволюционную эпистемологию как практику познания, адекватную концепциям познания, формируемым когнитивной наукой. К феномену познания нельзя подходить, будто во внешнем мире существуют факты или объекты, которые мы постигаем и храним в голове. В эволюционной эпистемологии познание рассматривается не

как представление мира в готовом виде, а как непрерывное сотворение мира через процесс самой жизни.

Эволюционная эпистемология описывает познание как процесс конструирования, но вопрос в том, кто конструирует и по каким законам? Известно, что формы конструктивизма весьма разнообразны. Например, сторонники социального конструктивизма трактуют знание как функцию лингвистических конвенций, утвердившихся в культурных традициях и стандартах научного дискурса. Но это лишь одна сторона медали. Вторая сторона раскрывается в эволюционной эпистемологии и на основе онтологии, построенной на идеях глобального эволюционизма, системности. В этом ракурсе коммуникативный уровень взаимодействий понимается не как фундаментальный, а как эволюционно обусловленный. Познание трактуется как «проживание», совместная деятельность. Сказанное является основанием для выделения такой формы конструктивизма, как эволюционный конструктивизм, который основывается на установке реализма, исходит из того, что мышление не открывает объекты и не создает их, а скорее конструирует, извлекает из реальности то, что соотносимо с его деятельностью. Конструктивистская концепция познания строится на основе идей самоорганизации и историзма.

Одним из ярких представителей эволюционного конструктивизма является Д. Деннет.

Особенность эволюционного конструктивизма в том, что при конструировании знания используется более богатый спектр когнитивных ресурсов, нежели индивидуальный опыт. Человек конструирует знание, обрабатывая информационные потоки, идущие от физического мира (объекта), от биологической материи (физиологический и сенситивный аппарат), от социума и культуры (ценности, язык, коммуникативные связи...). Если выделить какой-то один поток информации, картина процесса будет искажена. Поэтому семантический анализ знаний в аналитической философии науки или социологический анализ в социологии науки не способны создать системной картины конструирования или, можно сказать, инжиниринга знания.

В этом смысле когнитивная наука предстает как технология знания, она рассматривается как вариант неклассической эпистемологии и одновременно как онтология мышления. Она вписывает мышление в картину реальности, формируемую эволюционно-синергетической парадигмой современной науки. В когнитивной науке познание обретает онтологическую размерность, это подчеркивали У. Матурана и Ф. Варела, характеризуя познание как жизненность, и Д. Деннет, чья трактовка познания является одновременно и метафизикой, которую называют «метафизикой дизайна».

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АСПЕКТЫ МЕЖДИСЦИПЛИНАРНОЙ ИНТЕГРАЦИИ В КОГНИТИВНОЙ НАУКЕ

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Когнитивные исследования междисциплинальны по своему происхождению, по методам и по перспективам практического использования. Термины «междисциплинарность», «полидисциплинарность» означают не только преодоление дисциплинарных границ и возникновение новых научных тандемов, не только выход науки на новое интегративное пространство исследования, но и становление нового типа мышления — мышления диалогового, коммуникативного.

Междисциплинарные исследования имеют два аспекта интеграции. Первый связан с

переходом от дискретного, атомистического мировосприятия к системному. Мировоззрение, обозначаемое как декартовское мировидение, в котором физическое и метальное — два самостоятельных начала, явилось основанием деления всего многообразия наук на естественные и гуманитарные. В свою очередь, выявление специфики различных форм движения материи служило основанием для дисциплинарной структуры наук о природе. В квантово-релятивистской картине мира сформировалось представление о реальности как взаимосвязях и отношениях, о реальности как процессе: нельзя взирая на действительность как зритель, со стороны, необходимо участвовать, изменяя ее и одновременно себя (синергетический подход). Реальность не только воспринимается разумом, но конструируется им. Любой объект познания

включен в некий заранее истолкованный контекст, за пределами которого находятся другие, тоже заранее истолкованные контексты.

Второй аспект междисциплинарной интеграции характеризуется особым типом мышления, так называемым сложным мышлением, сопрягающим сложность, порождаемую познанием, и сложность саморазвивающихся природных систем. Познание, понимаемое как этап глобального эволюционного процесса, как жизнедеятельность, рождает новый уровень сложности. Если мышление есть составляющая реальности, то мыслить о ней возможно только с учетом мысли о мысли.

Междисциплинарность — это не только соседство отдельных дисциплин по той или иной проблеме, ее сущность в кооперации, в результате которой возникает новое системное качество, про которое говорят: целое не больше и не меньше частей, из которых состоит, оно просто иное. Сегодня наряду с понятием «междисциплинарность» используются понятия «полидисциплинарность», «трансдисциплинарность», имеющие свою смысловую нагрузку. Когнитивная наука столкнулась с проблемой создания трансдисциплинарного языка.

Сегодня познание изучается не только в философии, но и в конкретных науках. В такой междисциплинарной программе, как когнитивная наука, познание познания осуществляется средствами рефлексии второго порядка, здесь исследование познания выходит на более высокий уровень концептуализации. В когнитивной науке реализуется эволюционно-информационный подход к познанию, познание понимается как создание и переработка информации. В классической философии познание, как правило, принималось как данность (врожденная способность, Божественный дар, исходная очевидность и т.д.), в неклассической горизонт когнитивных практик гораздо богаче. Выделяют модель познания как отражения, репрезентативную модель познания, проективно-конструктивную модель, герменевтическую практику познания, конструктивистские модели, модель познания, представленную эволюционной эпистемологией.

В работах автора наряду с понятием когнитивной практики с целью анализа научного познания и его исторической динамики вводится понятие эпистемологической схемы. Сравнивая анализ познания в когнитивной науке и в философии, отметим следующее. В когнитивной науке познание понимается не как исходная данность, а как звено и функция

универсального эволюционного процесса. Эволюционный подход к познанию вписывает мышление в картину реальности, формируемую эволюционно-синергетической парадигмой современной науки, формирует онтологию мышления. Показано, что наиболее адекватной эпистемологической схемой познания в аспекте эволюционно-информационного подхода считается эволюционная эпистемология, в которой познание трактуется как адаптационный процесс конструирования знаний.

В когнитивной науке используется более богатый спектр когнитивных ресурсов, нежели индивидуальный опыт. Человек конструирует знание, обрабатывая информационные потоки, идущие от физического мира, от биологической материи, от социума и культуры. Поэтому семантический анализ знаний в аналитической философии науки, или социологический анализ в социологии науки создают одностороннюю картину, в то время как системно-эволюционный подход когнитивной науки конструирует знание в соответствии с законами и запретами эволюции. В этом смысле когнитивная наука предстает как современные междисциплинарные исследования познания. Она снимает основное противоречие традиционной гносеологии и выводит исследование когнитивных процессов на новый уровень, где дополнительной размерностью анализа являются процессы формирования когнитивного аппарата познающего субъекта в процессе адаптивной деятельности.

Когнитивная наука сплотила различные дисциплины, предложив более современное видение проблемы природы человека. Важнейший философский аспект когнитивных исследований связан с антропологической проблематикой, актуализацией проблемы природы человека в контексте современных NBIC-технологий. Междисциплинарные исследования природы человека получили новый импульс развития в свете новых технологий. В обществе, живущем в эпоху глобального цивилизационного кризиса, для которого экологическая проблема стала вопросом выживания, в котором технаука и особенно NBIC-технологии становятся силой, способной коренным образом изменить природу человека и его жизнедеятельность, наиболее актуальной задачей является обретение умудренного разума. Мнение, что совершенствование когнитивной компетенции вида *Homo Sapiens* может вести к угасанию человечества, уже высказывалось ранее, а сегодня в связи с новым этапом в развитии научного познания, связанным с NBIC конвергенцией и

возможностями искусственного преобразования человеческой природы, ставится вопрос о качественно новом этапе в когнитивной эволюции. Вопрос о последствиях искусственного изменения природы человека и когнитивного

аппарата – вопрос, в котором затронуты не только сфера самопознания, но саморазвития и самосохранения.

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ПОЗДНИЕ ВЫЗВАННЫЕ ПОТЕНЦИАЛЫ КАК КОРРЕЛЯТЫ ПРОЦЕССОВ ПРЕДВНИМАНИЯ И ВНИМАНИЯ В КОНТЕКСТЕ ИНДИВИДУАЛЬНЫХ РАЗЛИЧИЙ

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Согласно ресурсной теории Д. Канемана, внимание представляет собой ограниченный ресурс, распределяемый между текущими психическими процессами (Канеман, 2006). Количество доступных ресурсов зависит от уровня активации, который, в свою очередь, определяется рядом факторов как внешней, так и внутренней природы (Канеман, 2006, Шнайдер и др., 2011). Помимо активационного (энергетического, силового) аспекта, традиционно подчеркиваемого в ресурсных теориях, существует также временной аспект, так как функции оценки необходимых ресурсов и распределения внимания, постулированные в ресурсных теориях внимания, можно представить как вычислительные процессы, требующие определенного времени для их осуществления. Временной аспект процессов распределения внимания особенно актуален в задачах, требующих быстрого принятия решения после поступления стимула.

Хотя в настоящий момент не представляется возможным установить однозначное соответствие между элементами схемы внимания Д. Канемана и происходящими в мозге физиологическими процессами, теория Канемана может выступить многообещающей теоретической основой для физиологических исследований внимания. В частности, физиологические исследования на животных позволили показать, что в основе активации, обеспечивающей пул доступных ресурсов, лежит функционирование ряда нейромодуляторных систем мозга (Чернышев и др., 2005, Børgers et al., 2005, и мн. др.).

Одним из хорошо зарекомендовавших себя способов изучения протекания быстрых событий в мозге человека является анализ вызванных потенциалов – суммарной электрической активности, генерируемой в мозге в ответ на внешние

события. В качестве косвенной меры устойчивого внутреннего уровня активации и характеристик временных свойств психических процессов может быть использован темперамент. Темперамент трактуется большинством авторов как совокупность биологически детерминированных относительно неизменных в течение жизни свойств, определяющих интенсивные и временные аспекты поведения и психической деятельности (Айзенк, 1999, Русалов, 2002, Стреляу и др., 2009, и др.). Таким образом, в описании свойств темперамента используются те же аспекты – силовой и временной, – которые актуальны и для анализа процессов внимания. Более того, имеются указания на то, что индивидуальные вариации темперамента могут быть объяснены через различия в функционировании ряда нейромедиаторных систем мозга (Bond, 2001, Mulder, 1992).

Задача настоящего исследования состояла в том, чтобы с помощью методики вызванных потенциалов изучить динамику процессов, протекающих в мозге во время реализации задачи, требующей внимания, и сопоставить эту динамику со свойствами темперамента в силовом (интенсивностном) и временном (скоростном) аспектах.

Эксперименты проведены на 30 испытуемых в возрасте 18–27 лет. Регистрацию вызванных потенциалов производили во время реализации экспериментальной парадигмы «активный одд-болл», требующей от испытуемых реакции на редкие стимулы, включенные в последовательность других стимулов. Два звуковых стимула, уверенно различавшиеся всеми испытуемыми, подавали в случайном порядке с отношением вероятностей 1:4. Редкий стимул являлся целевым (значимым), и испытуемые в ответ на него должны были нажимать на кнопку миниатюрного геймпада. Когерентное усреднение производили по 30–40 предъявлениям значимого стимула (фильтрация 1–30 Гц). Определяли пиковые латентности

и амплитуды длиннолатентных компонентов вызванного потенциала 15 окологенеральных отведений. Определение свойств темперамента производили с помощью Павловского опросника темперамента Я. Стреляу (PTS) (Стреляу, 1982), личностного опросника Г. Айзенка (EPI) (Шмелев, 2002) и Опросника структуры темперамента (ОСТ) В. М. Русалова (Русалов, 1990, 2000). Статистический анализ производили с помощью общей линейной модели.

Получены два основных экспериментальных результата. Во-первых, экстраверсия (EPI1) и подвижность нервной системы (PTS3) проявили высокую достоверную отрицательную связь с амплитудой комплекса N1-P2, а также, в меньшей степени, с абсолютной амплитудой N1. Во-вторых, экстраверсия (EPI1) и Социальная эргичность (ОСТ2) проявили отрицательную связь с латентным периодом N2.

Ряд исследований показывает, что экстраверсия объединяет в себе как силовые, так и временные аспекты темперамента (Стреляу и др., 2005). В случае первого полученного нами результата, видимо, проявились временные аспекты темперамента, и можно предположить, что меньшая амплитуда комплекса N1-P2 и N1 отражают менее затратную (и соответственно, более эффективную) работу автоматических систем предвнимания, позволяющую быстрее выбирать мишени для распределения внимания. В случае второго результата, видимо, преимущественно проявились силовые аспекты темперамента (эргичность). Можно предположить, что более ранняя генерация волны N2 отражает более быстрый процесс перехода обработки информации о конкретном стимуле из автоматического

состояния предвнимания в состояние собственно внимания, что, в свою очередь, создает предпосылки для более высокой силы (эргичности).

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ВРЕМЯ РЕАКЦИИ И АФФЕКТИВНАЯ ОЦЕНКА КАК КОСВЕННЫЕ ПОКАЗАТЕЛИ СОВЕРШЕНИЯ ОШИБКИ

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Ошибочные ответы, в сравнении с правильными, обычно характеризуются более высоким временем ответа, по крайней мере, в случаях ориентации на точность, а не на скорость ответа (напр. Anderson 1981, Robinson et al. 1997; Аллахвердов 2000; Скотникова 2005). В то же время проведенные нами эксперименты на материале задач узнавания показывают, что совершение ошибки также может снижать оценку стимула, причем степень

снижения пропорциональна «грубости» ошибки (Четвериков 2011 а). Например, ошибка неузнавания стимула, предъявленного пять раз, вызывает большее снижение оценки, чем ошибка неузнавания стимула, предъявленного один раз. В данной работе мы на материале задач узнавания сравниваем чувствительность времени реакции и оценки стимула после принятия решения об узнавании по отношению к правильности ответа.

Процедура. Набор стимулов случайным образом разделялся на две равные части. Первая половина затем предъявлялась испытуемым, оставшиеся служили контрольными стимулами

в последующих задачах. Половина предъявляемых стимулов показывалась 1 раз, половина 5 раз. Время предъявления стимула составляло 40 мс, без пауз между предъявлениями. Испытуемые получали инструкцию внимательно просмотреть предъявляемые стимулы и постараться запомнить как можно больше из них. Затем испытуемым давались задачи вынужденного выбора на узнавание и предпочтение. В каждой задаче последовательно предъявлялись пары стимулов, в каждой паре один из стимулов был предъявлен на первом этапе (целевые стимулы), другой – нет (контрольные стимулы). Целевые и контрольные стимулы в обеих задачах были одни и те же, но пары варьировались случайным образом. Вторая задача начиналась после того, как испытуемые выполняли первую задачу для всех стимулов. Половина испытуемых сначала выполняла задачу на предпочтение, потом на узнавание, половина – наоборот. Исследование проводилось через интернет с помощью специально разработанного программного обеспечения.

Стимульный материал. В Эксперименте 1 предъявлялись фотографии лиц из набора «Aberdeen» базы изображений PICS. Было использовано 88 фотографий, 60 мужских лиц, 28 женских. Количество мужских и женских лиц среди целевых и контрольных стимулов было сбалансировано. В Эксперименте 2 стимульным материалом служили изображения 120 иероглифов черного цвета размером примерно 90 на 90 пикселей.

Испытуемые. Испытуемых находили через социальные сети, они принимали участие добровольно и без дополнительного вознаграждения. В Эксперименте 1 приняли участие 135 человек (100 Ж, 35 М, ср. возраст 22.5 года). В Эксперименте 2 приняли участие 202 человека (154 Ж, 48 М, ср. возраст 22,0 года).

Результаты. Точность узнавания стимула в обоих экспериментах значимо не отличалась от случайной. Для анализа взаимосвязи точности ответа, частоты предъявления стимула и времени реакции испытуемого использовалась линейная регрессия, время ответа служило зависимой переменной. В Эксперименте 1 результаты анализа показали, что ни точность ответа ($B = 50$, $SE = 35$, $t = 1.4$, $p = .15$), ни частота предъявления стимула ($B = 15$, $SE = 36$, $t = 0.4$, $p = .67$), ни их взаимодействие ($B = -56$, $SE = 49$, $t = -1.1$, $p = .26$) не были значимыми предикторами времени реакции. В то же время анализ взаимосвязи с аффективной оценкой стимулов, оцененный с помощью логистической регрессии (предикторы – правильность ответа в задаче узнавания

для целевого стимула, субъективное узнавание контрольного стимула, частота предъявления целевого стимула), показал, что точность ответа ($B = 0.28$, $SE = 0.11$, $z = 2.6$, $p = .010$), частота предъявления ($B = -0.28$, $SE = 0.11$, $z = -2.49$, $p = .013$) и их взаимодействие ($B = 0.40$, $SE = 0.15$, $z = 2.6$, $p = .010$) были значимо взаимосвязаны с оценкой. Анализ доверительных интервалов показал, что стимулы, предъявленные пять раз, оценивались хуже (вероятность выбора $P = .39$, $CI = [.35, .43]$), чем стимулы, предъявленные один раз ($P = .45$, $CI = [.42, .49]$), если они были не узнаны, и на уровне тенденции – лучше, если они были узнаны ($P = .56$, $CI = [.52, .59]$ и $P = .53$, $CI = [.49, .56]$, соответственно). При этом подобные результаты не были получены для случая, когда оценка стимулов предшествовала задаче узнавания (хотя там также присутствовала взаимосвязь между оценкой стимулов и субъективным узнаванием, но частота предъявления не играла никакой роли), что говорит об изменении оценки вследствие узнавания или ошибочного неузнавания целевого стимула.

Аналогичные результаты были получены в Эксперименте 2. Ни точность ответа ($B = 2.9$, $SE = 21.6$, $t = 0.1$, $p = .89$), ни частота предъявления стимула ($B = 10.9$, $SE = 21.6$, $t = 0.5$, $p = .62$), ни их взаимодействие ($B = -2.3$, $SE = 30.1$, $t = -0.1$, $p = .94$) не были значимыми предикторами времени реакции. В то же время анализ взаимосвязи с аффективной оценкой стимулов показал, что точность ответа ($B = 0.25$, $SE = 0.08$, $z = 3.3$, $p < .001$), частота предъявления ($B = -0.13$, $SE = 0.08$, $z = -1.66$, $p = .095$) и их взаимодействие ($B = 0.29$, $SE = 0.11$, $z = 2.7$, $p = .007$) были значимо взаимосвязаны с оценкой. Анализ доверительных интервалов показал, что стимулы, предъявленные пять раз, оценивались хуже (вероятность выбора $P = .436$, $CI = [.410, .462]$), чем стимулы, предъявленные один раз ($P = .467$, $CI = [.441, .492]$), если они были не узнаны, и лучше, если они были узнаны ($P = .572$, $CI = [.545, .598]$ и $P = .531$, $CI = [.504, .558]$ соответственно).

Таким образом, результаты обоих экспериментов показывают, что аффективная оценка более чувствительна к точности ответа, по крайней мере в тех условиях, когда вероятность правильного ответа не отличается от уровня шанса. Данный результат не может быть объяснен недостаточной чувствительностью интернет-экспериментов, так как ранее с использованием аналогичного программного обеспечения нам удавалось фиксировать различия по времени реакции, например, на материале задач сличения (Четвериков 2011b; Четвериков,

Новикова, & Мазнева 2010). В дальнейших исследованиях мы планируем проверить гипотезу о том, что различие правильных и неправильных ответов по времени реакции опосредовано аффективной оценкой стимула.

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ИСПОЛЬЗОВАНИЕ ЗНАКА КАК СПОСОБ ПРЕОДОЛЕНИЯ ОГРАНИЧЕНИЯ РЕСУРСА РАБОЧЕЙ ПАМЯТИ В ПРОЦЕССЕ РЕШЕНИЯ ЗАДАЧ

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Постановка проблемы. В настоящее время механизмы решения задач остаются мало исследованными. Одним из таких механизмов, определяющим особенности решения, является наличие ограниченного ресурса рабочей памяти (РП) (Бэддели, 2001). Перегрузка ресурса РП ведет к тому, что задача не может быть решена «наглядно», «в лоб» и требует от испытуемого использования стратегий построения репрезентации задачи и оперирования элементами в процессе решения. Согласно обзору Hambrick & Engle (2003), существует сравнительно небольшое количество исследований (24 работы) роли механизмов памяти в процессах решения задач. Большинство из них строится либо по принципу использования задания-дистрактора для ухудшения процесса решения (европейский подход), либо по принципу корреляционных исследований выраженности параметров РП и эффективности решения (североамериканский подход). Существующие исследования ориентируются на количественный показатель и не принимают в расчет возможности оптимизации поступающей информации. Одним из средств такой оптимизации может являться использование знака (Выготский, 1960). Если данное предположение верно, можно предполагать, что модуль РП имеет более сложную организацию, чем предполагается ныне. В данной работе изложены результаты серии экспериментов, генеральной целью которых

являлось подтверждение влияния загрузки рабочей памяти на решение мыслительных задач и доказательство возможности разгрузки (предполагающего сокращение количества перерабатываемой информации) с помощью использования знака. Предполагается, что использование адекватного внешнего средства (знака) будет иметь более сильный эффект по сравнению с потенциальной загруженностью РП за счет предъявления задачи-дистрактора. В качестве стимульного материала предлагались специально разработанные задачи. Эти задачи представляют собой совокупность элементов, представленных именами, связанных отношениями роста. Требуется установить, в каком ростовом соотношении находятся люди из предложенной пары в вопросе (например, Пахом выше Михея, Сидор выше Пахома. Каков Сидор по отношению к Михею?). Задачи состояли из 5 элементов (имен)

В первой (вспомогательной) серии нами ставилась задача определить, какая из подчиненных систем РП загружается преимущественно при решении данных задач (фонологическая петля/оптико-пространственный блокнот), с тем, чтобы в дальнейшем подобрать адекватные средства разгрузки для проверки выдвинутой гипотезы. Испытуемым предъявляются задачи при трех условиях: 1) регулярное произношение словосочетания по ходу решения задачи (загрузка фонологической петли); 2) требуется неотрывно смотреть на экран, на котором представлены оптические иллюзии, решая параллельно задачу (загрузка оптико-пространственного блокнота); 3) решение задачи без каких-либо сопутствующих дистракторов.

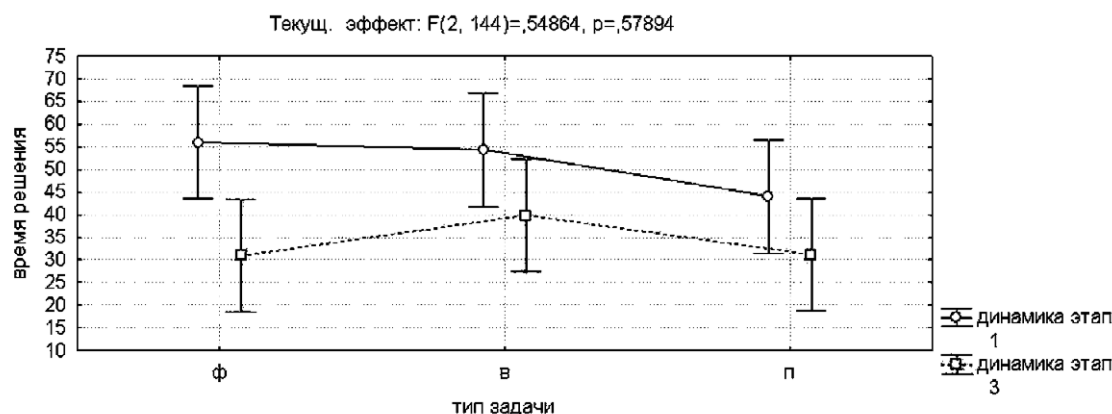


График 1. Динамика решения различных типов задач.

Основные результаты. Дисперсионный анализ не выявил значимых различий во времени решения в зависимости от условия задачи. Однако можно видеть, что время решения задач при предъявлении дистракторов больше. Дисперсионный анализ динамики решения выявил значимые различия, это говорит о том, что испытуемые «научаются» решать задачи. Вырабатывают некие эвристики. На первом этапе решатель выстраивает последовательно элементы задачи точно по условию, затем обращает внимание на вопрос. Впоследствии же решатель, как правило, сразу обращает внимание на элементы вопроса и строит решение, исходя из этого (или же включаются иные эвристики).

Кроме того, из графика видно, что ВР задач с дистрактором на оптико-пространственный блокнот (В) становится большим относительно других условий, в то время как загрузка фонологической петли (Ф) оказывается не столь значимой в данном случае. Вероятно, происходит замена проговаривания имени (элемента) на более экономичный способ репрезентации, что впоследствии снижает затрачиваемый ресурс. Данные результаты привели нас к выбору для второй серии в качестве способов задания-дистрактора и средств разгрузки материала способов, предполагающих преимущественно образную переработку.

Целью основной экспериментальной серии является установление роли разгрузки РП в успешности решения задач при использовании знака. В качестве средств разгрузки (знаков, фасилитаторов) использовались гистограммы, каждая из которых представляет поочередно

сравнимые пары (первая первую и т.п.) элементов условия. Высота столбика в диаграмме пропорциональна росту героя, которого он символизирует. В качестве загрузки использовались также оптические иллюзии (дистракторы). Итак, решателю предлагается 12 задач при 4 условиях: 1) на фоне оптической иллюзии; 2) на фоне оптической иллюзии с гистограммами; 3) с гистограммами на нейтральном фоне; 4) решение задачи без дистракторов и фасилитаторов.

Основной результат. Дисперсионный анализ выявил значимые различия во времени решения задач в зависимости от наличия фасилитатора: задачи с использованием знака решались значительно быстрее ($F=64,1$; $p<0,001$). Это подтверждает предположение о ведущей роли разгрузки РП с помощью знака по сравнению с абсолютным количеством перерабатываемой информации в успешности решения задач.

Выводы:

1. Подтверждена роль загрузки РП в процессе решения мыслительных задач. Перегрузка ресурса ведет к снижению эффективности.

2. Установлена возможность использования знака как инструмента разгрузки рабочей памяти. Использование знака ведет к снятию разрушающего воздействия задачи-дистрактора.

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ИНТЕГРАЦИОННЫЕ ВЗАИМОДЕЙСТВИЯ ПАРАМЕТРОВ КОНВЕРГЕНТНОГО И ДИВЕРГЕНТНОГО ИНТЕЛЛЕКТА В ОНТОГЕНЕЗЕ

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Совершенствование интеллектуальной деятельности в онтогенезе, сопряженное с переходом от мыслительных операций, базирующихся на конкретных образах и формах, к ментальному манипулированию абстрактными категориями, осуществляется посредством существенных перестроек системы взаимодействий между отдельными компонентами интеллекта.

Цель исследования состояла в изучении гетерогенности созревания интеллектуальных функций в онтогенезе, определяющих объединение отдельных составляющих дивергентного и конвергентного интеллекта в единую систему, а также сравнительный анализ особенностей этого процесса у лиц мужского и женского пола.

В тестировании приняли участие школьники обоего пола: 31 мальчик и 31 девочка в возрасте 7–8 лет, 21 мальчик и 27 девочек в возрасте 9–10 лет, 77 мальчиков и 73 девочки в возрасте 11–12 лет, 72 мальчика и 89 девочек в возрасте 13–14 лет, 27 мальчиков и 33 девочки в возрасте 15–16 лет. Для оценки уровня конвергентного интеллекта (коэффициент IQ) использовали тест Векслера в модификации Агафоновой Н. Н. с соавт. (1991). Уровень развития дивергентного интеллекта определяли по тесту Торренса (Torrance E. P., 1974) в русскоязычной редакции Туник Е. Е. (2002).

Проведенные исследования позволили установить, что наряду с общими тенденциями, сближающими лиц с различным уровнем интеллектуального развития конкретной возрастной группы, существуют и качественные особенности ментальной активности высокоинтеллектуальных индивидов, обусловленные специфическими стилями их деятельности. Интеллектуально одаренные лица характеризовались опережающими темпами развития индуктивного мышления (по сравнению с другими протестированными характеристиками интеллекта), что вероятно обуславливало качественное своеобразие создаваемых ментальных схем, в гораздо большей степени базирующихся на использовании логических преобразований, операций структурирования и соподчинения отдельных элементов информационного

тезауруса. Преобладающим способом формирования ментальных репрезентаций в структуре индивидуального опыта у лиц со средним уровнем интеллекта служило простое запоминание предъявляемого материала, что отражалось в существенном преобладании показателей общей эрудиции над параметрами индуктивного мышления в профиле их конвергентного интеллекта.

Интеллектуальное развитие в период между 7 и 11 годами происходит за счет преобладающего совершенствования способности к построению умозаключений. Причем данная тенденция, отражающая переход к более совершенному уровню информационных процессов, основанных на систематизации и обобщении имеющихся сведений, позволяющая формировать ментальные схемы принципиально более высокой степени концептуальной сложности, свойственна высокоинтеллектуальным испытуемым.

В 13–14 лет при среднем IQ опережающими темпами нарастает уровень общей эрудиции при относительно сниженном темпе прироста эффективности построения умозаключений и лингвистических способностей. Перечисленные изменения профиля вербального IQ можно охарактеризовать как частично регрессивную тенденцию. Особого внимания заслуживает тот факт, что данная тенденция в более выраженной форме прослеживается у лиц со средним уровнем развития, нежели у лиц с высоким индексом интеллекта. При высоком уровне IQ у лиц мужского пола этого возраста увеличивается эффективность построения умозаключений на фоне несколько сниженных (по сравнению с предыдущим периодом) темпов прироста показателей индуктивного мышления и математических способностей. У лиц женского пола с высокими индексами IQ темпы совершенствования эффективности построения умозаключений сохраняются неизменными, однако снижаются темпы прироста показателей индуктивного мышления.

Следует отметить, что процесс индивидуального развития идет по пути не только совершенствования интеллектуальных функций, но и объединения их во взаимосвязанную систему. Происходит нарастание структурированности интеллекта, характеризующегося на более поздних этапах становления обширной системой взаимосвязей между отдельными

компонентами. Значимость определенной когнитивной характеристики и степень ее участия в формировании общего интеллектуального потенциала личности существенно варьирует на разных этапах развития.

Рассматривая процесс становления интеллекта, можно отметить, что на начальных этапах развития отдельные параметры конвергентного и дивергентного интеллекта в значительной степени автономны. По мере совершенствования отдельных характеристик интеллекта расширяется и структура взаимосвязей между ними; причем отмечается не только увеличение числа взаимосвязей, но и нарастание степени их жесткости. Однако данный процесс не носит строго линейного характера; усложнение системы на некоторых этапах развития может сменяться частичным регрессом, сопряженным с распадом отдельных ее звеньев. Наиболее существенные перестройки в структуре сформировавшейся системы происходят в подростковом возрасте, когда целый ряд сложившихся на более ранних этапах онтогенетического развития взаимосвязей подвергается деструкции. Наличие критического периода в развитии системы взаимосвязей между отдельными компонентами интеллекта в возрасте 11–13 лет связано с переходом к ментальным процессам более высокого уровня формализации, в частности, к использованию абстрактных категорий. Перестройки системы взаимосвязей между отдельными параметрами дивергентного интеллекта выражены

значительнее, поскольку он в большей мере подвержен влиянию биологических факторов развития и в меньшей степени обусловлен процессами целенаправленного обучения (Guilford J., 1967, Eysenck H., 2003).

Система взаимосвязей параметров интеллекта у лиц мужского пола в основном повторяет элементы, свойственные лицам женского пола более раннего возраста, за исключением взаимосвязей, базирующихся на математических способностях. Известно, что существуют выраженные гендерные различия в эффективности овладения теоретическими основами математического мышления (Visser D., 1987). Компоненты когнитивных способностей, определяющие качественные отличия интеллектуального уровня, объединяются в систему взаимосвязей, формирующуюся в онтогенезе, в первую очередь (на самых ранних этапах развития).

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КРОСС-КУЛЬТУРНЫЕ ОСОБЕННОСТИ ВОСПРИЯТИЯ ВРЕМЕНИ

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Время в сознании и поведении человека приобретает конкретное психологическое содержание как элемент культуры, люди из разных культур по-разному переживают время. У представителей разных культур формируются различные Я-концепции, которые влияют на все аспекты индивидуального поведения и восприятия времени. (Мацумото Д., 2003, Гуревич А. Я., 1984).

Цель данной работы состояла в изучении особенностей восприятия времени и временной перспективы жителей различных европейских государств (Великобритании, Литвы, России).

Задачи. 1. Выявить наиболее свойственные особенности восприятия времени каждой отдельной культурной группы. 2. Проследить взаимосвязь особенностей восприятия времени с личностными характеристиками в каждой группе. 3. Сравнить представления о времени и временной перспективе в данных группах.

Гипотезы. 1. Отношение ко времени имеет национально-культурные особенности; 2. Россия и Литва, как недавно бывшие Советские Республики, будут более схожи между собой и отличны от Англии.

Методика. В исследовании использованы 7 методик: методика субъективной линии жизни А. А. Кроника; методика Дж. Роттера, направленная на определение уровня локуса контроля; методика Ч. Д. Спилбергера, направленная на изучение личностной тревожности;

методика Г. Айзенка – на изучение уровня экстраверсии/интроверсии и нейротизма; методика оценочных шкал течения времени А.А. Кроника, направленная на изучение субъективного течения времени; методика М. Розенбергера на определение уровня самоуважения; методика Ж. Нюттена на определение перспективы будущего и мотивационных объектов в данной перспективе. При обработке результатов последней методики экспертами были выделены группы для мотивационных объектов: гедонистическая группа (т.е. те, отмеченные испытуемым объекты, которые приносят ему удовольствие, такие, как отдых, хобби и т.д.); группа социальных факторов (работа, учеба, определенные знания, основывающиеся на стремлении занимать желаемую социальную позицию); группа, относящаяся к объектам, связанным со здоровьем; группа, относящаяся к семейным объектам (планы, намерения, желания, направленные на своих родных); неклассифицируемая группа, т.е. объекты, не принадлежащие ни к одной из вышеперечисленных групп, либо отсутствие ответа.

Темпоральная шкала, на которой располагаются мотивационные объекты, была разделена на 5 следующих групп: первую группу составляли объекты, достижение которых предполагается в пределах одного-двух дней; вторая группа – «день- месяц», т.е. осуществление определенного намерения, по мнению испытуемого, может занять от одного дня до одного месяца; третья группа – «месяц – 3 года»; четвертая группа принадлежит к интервалу «более 3 лет»; последнюю неклассифицируемую группу составляли не классифицируемые объекты во времени или незавершенные предложения.

Процедура. Основным методом сбора данных был анкетный опрос. Каждому испытуемому была предложена батарея методик. Исследовательская работа проводилась в разных странах: в России, Великобритании и Литве. Таким образом, все методики были предъявлены на соответствующих языках. Работа проводилась на протяжении двух лет.

В исследовании приняла участие 103 человека, в возрасте от 35 до 71 года: 35 россиян, 35 литовцев, 33 представителя Великобритании.

Результаты. Выявлены кроссэтнические различия, касающиеся восприятия и оценки времени жителями России, Литвы и Великобритании. Англичане в значительно большей степени, чем жители двух других государств, воспринимают время как медленное, однообразное и неограниченное. Для россиян основные оценочные характеристики времени

закладаются в его высокой скорости, организованности, разнообразии и ограниченности. Литовцы, наряду с россиянами, воспринимают время как быстрое и разнообразное, но считают его менее организованным, цельным и непрерывным.

У жителей Великобритании более выражена отдаленная перспектива реализации мотиваций. Основной срок этой реализации они относят к периоду, превышающему три года, в то время как у россиян и литовцев этот срок находится в диапазоне от одного месяца до трех лет. Сами же эти мотивации у англичан являются в большей степени гедонистскими, т.е. направленными на получение удовольствия, например, путешествия, отдых, хобби и т.д., в то время как у россиян и литовцев – социальными, т.е. направленными на объекты, определяющие социальное положение, статус, взгляды, установки, представления индивида в системе отношений в обществе, например, работа, учеба, определенные знания, основывающиеся на стремлении занимать желаемую социальную позицию (знание иностранных языков и т.д.). Несмотря на это, ожидаемая продолжительность будущего у англичан оказывается меньше, чем у двух других групп.

Выявлено, что между выборками из жителей трех государств нет достоверных различий по степени выраженности нейротизма, локуса контроля и тревожности, однако англичанам в гораздо большей степени по сравнению с двумя другими группами свойственна экстраверсия. Кроме того, степень самоуважения у англичан по сравнению с таковой у россиян и литовцев оказалась существенно заниженной.

В некоторых случаях была обнаружена связь восприятия времени и временной перспективы со степенью экстраверсии, локусом контроля и тревожностью. Характер этих связей был различен в разных этнических группах. У англичан при интернальном локусе контроля и низкой тревожности, время воспринимается насыщенным. Экстравертированность и высокий локус контроля данной культуры указывают на цельность течения времени. Перспектива будущего у англичан коррелирует с высоким уровнем экстраверсии. Гедонистические объекты, которые преобладают в данной культурной группе, коррелируют с локусом контроля.

У россиян интроверсия коррелирует с непрерывностью и организованностью времени, с последним коррелирует и нейротизм. Низкая тревожность у россиян свидетельствует о высокой организованности времени. Высокий

локус контроля свидетельствует о скачкообразности и раздробленности времени.

У литовцев прослеживается корреляция уровня экстраверсии и нейротизма с плавностью течения времени. Обнаружена взаимосвязь организованности времени с тревожностью, где время более организованно при высоком

уровне тревожности, приятность времени выражена при низком уровне тревожности.

Интерпретация данных результатов, вероятно, связана с исторической, политической и экономической ситуацией данных государств.

РАЗРАБОТКА ОНТОЛОГИИ ПРОФЕССИОНАЛЬНОЙ ДЕЯТЕЛЬНОСТИ (НА ПРИМЕРЕ МЕДИЦИНЫ)

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Важными задачами совершенствования народохозяйственных предприятий, организаций и учреждений являются повышение эффективности их функционирования и достижение высоких конечных результатов деятельности на основе рационального использования имеющихся ресурсов. Достигнуты значительные успехи в повышении эффективности и качества работы за счет комплексной автоматизации в сферах материального учета, планирования ресурсов, финансово-экономического и организационного управления, движения и контроля документооборота и т.д. Для этого осуществляется глубокий системный анализ деятельности предприятий, организаций, построение концепции системы, автоматизирующей взаимосвязанные деятельности, ведется разработка информационных и других систем и осуществляется их внедрение. Используются инструментальные средства поддержки бизнес-моделирования и разработки таких систем (Business Studio, Silverrun, ARIS и др.).

Однако имеются сферы деятельности, процессы в которых связаны с интеллектуальной деятельностью и использованием постоянно обновляемых знаний; для них еще не создано инструментария, позволяющего комплексно автоматизировать деятельность. Так, при автоматизации лечебно-диагностических процессов автоматизируют взаимодействие между участниками лечебно-диагностического процесса, с акцентом на документирование всех шагов этого взаимодействия. Лечебно-диагностический процесс рассматривают как бизнес-процесс, аналогичный любым другим управленческим процессам. Формализованные и принятые к исполнению бизнес-процессы называют

медицинскими стандартами, уже стандартизировано такое понятие, как *электронная история болезни*. Задачи автоматизации интеллектуальной деятельности – постановки диагноза, назначения и прогнозирования лечения и т.п., если и решаются, то другими средствами (создаются отдельные экспертные системы). При этом есть проблемы с «уровнем знаний» (они часто упрощены), есть проблемы с сопровождением этих систем. В силу влияния внешних и внутренних факторов (здесь – непрерывного усовершенствования знаний), система должна быть адаптивной или управляемой. Требуется консолидация информации и знаний на уровне различных специалистов, различных подразделений и даже различных сфер (например, для медицины: образовательной, научной и практикующей «сфер»).

Целью настоящего исследования является 1) идентификация интеллектуальных видов деятельности в отдельно взятой достаточно сложной области профессиональной деятельности (медицина), 2) системный анализ и моделирование интеллектуальных процессов, 3) разработка онтологий всех используемых интеллектуальными деятельностями информационных компонентов, таких, чтобы они обеспечивали их повторную использование.

В рамках исследования проведена классификация деятельностей в медицине, выделены традиционные виды профессиональных деятельностей (*основные процессы, процессы управления, обеспечивающие процессы*). Из последнего класса отдельно идентифицированы виды деятельностей, направленные на совершенствование профессиональных деятельностей, в частности, *процессы моделирования, обучения* (специальности и использованию новых инструментов), *интеллектуально-обеспечивающие* (построение экспертных систем и тренажеров, индуктивное формирование знаний) и др.

В традиционных классификациях медицинских деятельностей «не видны» такие

проводимые врачами деятельности, как *планирование обследования* или *до-обследования* (с помощью лабораторных инструментов, в кабинетах функциональной диагностики, к узким специалистам для исключения определенных диагнозов), *построение прогноза лечения или развития болезни, коррекция лечения*, в том числе *коррекция первоначального диагноза*. Нет также используемых на практике *обращений за консультацией* к консилиуму врачей или другим специалистам. Современный подход к автоматизации бизнес-процессов (деятельностей) таких профессиональных сфер, как медицина, требует такой классификации деятельности, в которой *интеллектуальные виды деятельности*, требующие автоматизации, будут явно выделены.

С учетом этого и на основе известной классификации задач систем, основанных на знаниях, к медицинской деятельности отнесены такие интеллектуальные задачи: *задачи диагностики, задачи планирования, задачи прогноза, задачи ремонта и задачи обучения*.

В рамках исследования определены структура и характеристики интеллектуальных деятельности. Поскольку *интеллектуальные деятельности* (медицинской сферы) подразумевают возможность, а иногда и необходимость консультирования, то важным результатом деятельности является объяснение результата принятия решения. В том случае, когда деятельность осуществляется специалистом, «объяснение консультанта» используется для решения задачи; а в том случае, когда разрабатывается «автоматизированный консультант» в помощь специалисту, то «объяснение консультанта» формируется в результате решения задачи консультантом.

Для деятельности и подзадач медицинской сферы основным субъектом является пациент, а информационным компонентом (входным и результирующим) является сложно устроенный документ – история болезни пациента.

Содержимое этого документа расширяется в процессе применения различных подзадач медицинской деятельности.

Для каждого информационного компонента (история болезни, знания о заболевании, знания о наблюдениях, знания о лекарствах, объяснение результата диагностики и т.д.) разработаны их онтологии с учетом их ролей в разных процессах и достаточности для сохранения и удобства обработки информации. Построена модель сценариев каждой деятельности, модели связи между *структурными элементами каждой отдельной подзадачи* (учитывающие, например, что у «пациента» *происходят* «процессы в организме», *показателями которых являются* «значения наблюдений признаков» в «моменты времени», они *составляют* «дневник наблюдений» – важную часть «истории болезни»).

Построена *модель взаимосвязи между основными деятельностями* и их структурными компонентами и *модель взаимосвязи между основными деятельностями и обеспечивающими деятельностями* (результаты последних, например, становятся входными данными или знаниями или средствами получения знаний, решений или объяснений).

Совокупность вышеперечисленных онтологий и моделей составляет «ядро» онтологии профессиональной медицинской деятельности. Ожидается, что они станут основой для формирования *методологии системного анализа и моделирования* произвольных сфер деятельности с интеллектуальными процессами. В свою очередь методология даст возможность построить единую *онтологию профессиональной деятельности* специалистов, на базе которой могут быть разработаны технология и инструментарий автоматизации интеллектуальной профессиональной деятельности.

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ТИПЫ ОШИБОК ПРИ ВОСПРИЯТИИ И ПОНИМАНИИ АБСУРДНОГО ХУДОЖЕСТВЕННОГО ТЕКСТА

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Новизна сообщения заключается в соединении трех относительно независимых направлений исследования: 1) типологизации ошибок

понимания (письменного) текста (А. Р. Лурия, Л. С. Цветкова), 2) обсуждения проблемы адекватности понимания и субъективности интерпретации художественного текста, 3) изучения специфики абсурдного сообщения/высказывания. Данное исследование включается в круг наших работ на стыке когнитивной науки и педагогической психологии, задачей которых

является разработка инструментов для диагностики качества понимания текста (Шаповал 2008).

Выбор материала был сделан в пользу текста, условного «в квадрате»: художественного (*belles-lettres*), т.е. относящегося к вторичным моделирующим системам (Ю.М. Лотман, Б.А. Успенский), во-вторых, дополнительно искажающего реальность. Изучение нами восприятия абсурдного нехудожественного текста на примере «Яндексе-рефератов» показало, что презумпция авторитетности текста приводит к неверным выводам в понимании его смысла — наблюдается феномен «кажущегося понимания» (Левин 1998:593).

Материалом для задачи стало начало романа Татьяны Толстой «Кысь». Испытуемым данный текст был предложен без атрибуции, как фрагмент неизвестного текста:

Бенедикт натянул валенки, потопал ногами, чтобы ладно пришлось, проверил печную вьюшку, хлебные крошки смахнул на пол — для мышей, окно заткнул тряпичей, чтоб не выстудило, вышел на крыльцо и потянул носом морозный чистый воздух. Эх, и хорошо же! Ночная вьюга улеглась, снега лежат белые и важные, небо синее, высоченные клели стоят — не шелохнутся. Только черные зайцы с верхушки на верхушку перепархивают. Бенедикт постоял, задрал кверху русую бороду, сощурился, поглядывая на зайцев. Сбить бы парочку — на новую шапку, да камня нету.

В задании было сказано, что так начинается один современный роман, и предложено понять, реалистический это роман или фантастический. В случае затруднений вопрос мог быть упрощен: «Все ли нормально в тексте?», «Что здесь не так?»

Нормативный анализ (Н.Г. Алексеев, Э.Г. Юдин) позволяет задать ориентиры для определения адекватности понимания текста: на этапе восприятия необходимо заметить такие сигналы, как *зайцы с верхушки на верхушку перепархивают*; *черные зайцы*; *высоченные клели стоят*; *сбить бы ..., да камня нету*; *хлебные крошки ... для мышей*, *Бенедикт ... валенки*. На следующем этапе требовалось осмыслить замеченные сигналы и решить, какую действительность описывает текст: реальную или вымышленную.

Задачей настоящей работы является качественный анализ ответов испытуемых.

В большинстве своем испытуемые улавливают основные сигналы и правильно их осмысливают, делая вывод о фантастичности текстовой действительности. Приведем несколько

примеров: «Этот текст фантастический: в природе нет «летающих» зайцев, которых можно сбить камнем. И вряд ли нормальный человек будет кормить обычных мышей»; «Зайцы не бьют черные и не могут прыгать по верхушкам деревьев. Очень похоже на какую-то сказку»; «Я считаю, что этот текст нереальный, так как есть отклонения от действительности. Зайцы не могут быть черными и порхать по верхушкам, а снега не могут быть важными». Эти и другие примеры реакций испытуемых не свободны от ошибок, которые мы классифицируем следующим образом.

Ошибки восприятия: 1. Слово *клели* прочитывается как «ели». Возможно, таким образом проявляется феномен слепоты по невниманию (Кувалдина 2010); 2. Предлог «для» во фрагменте *смахнул крошки... для мышей* просто игнорируется — как и в предыдущем случае, ошибка может быть связана с незаметностью сигнала. Подобного рода ошибки вызваны, как правило, невнимательностью, недочитыванием и т.п. В нейропсихологии «угадывающее чтение» объясняется поражением височной доли левого полушария (Лурия, Цветкова 1996). Невосприятие сигналов приводит к невозможности дальнейшей работы.

Иной случай — реакция типа «ночью небо черное, оно синеть не может!», которая означает, что не замечена или не понята перифраза *ночная вьюга улеглась*. Непонимание смысла «утро» приводит к тому, что тексту приписывается излишняя «фантастичность».

Ошибки понимания: 1. Детали деревенского быта типа *проверил печную вьюшку* и информация о том, какого цвета бывают зайцы, — это скважины (Н.И. Жинкин). Денотатная неполнота текста заполняется за счет «фоновых знаний», и если этих знаний нет, деталь рассматривается как фантастическая; 2. Сочетание слов *Бенедикт натянул валенки* стилистически неоднородно и может быть определено как гибридизация — «смешение двух социальных языков в пределах одного высказывания» (Бахтин 1975:170), однако большинством испытуемых это не замечается.

Ошибки осмысления: 1. Обнаруживается нечто вроде «недоверия» к переносному значению слов: «человек не может задрать бороду — что, одну бороду, без головы?» (метонимия), «снега нельзя назвать важными» (метафора). В этом случае сказывается недостаточный опыт общения с художественными текстами; 2. Противоположная тенденция приводит к тому, что любое употребление рассматривается как метафорическое, а следовательно, «нормальное»

в рамках художественной системы: «это птицы, потому что зайцы не такие легкие, чтобы порхать с вершушки на вершушку». Данная проблема связана с «установкой на осмысленность» и в известной степени повторяет опыты осмысления фраз *Бесцветные зеленые идеи яростно спят* (Якобсон 1985:237), *Петр живет в стичечном коробке* (В. Я. Шабес) и др. под.; 3. Стремление «учить» героев произведения, что им следует делать («Если Бенедикту нужны зайцы на новую шапку, лучше пойти на охоту и пользоваться ружьем») является примером наивно-реалистического чтения (Ю. М. Лотман) и свидетельствует об абсолютном непонимании сути художественной условности.

Таким образом, осмысление абсурдного художественного текста состоит из тех же звеньев и управляется теми же законами, что и осмысление любого другого, однако в этом случае актуализируется проблема различения – в первую

очередь «ошибки» и «приема», прагматики и эстетики – и в целом распознавания природы текста. Большинство ошибок связано с неумением испытуемых работать с условностью.

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ОБ УНИВЕРСАЛЬНОМ ЯЗЫКЕ КОГНИТИВНЫХ НАУК

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Как показывают результаты четырех международных конференций по когнитивной науке, проблема сознания в междисциплинарной перспективе неминуемо сталкивается с ситуацией разобщенности языка представления данных, получаемых в рамках когнитивного объединения наук, так называемого контекста НБИКС (нано-, био-, инфо-, когно-, социо-) дисциплин. Говорить о едином подходе к исследованию когниции и разума придется с известной долей условности до тех пор, пока в методах и приемах, интегрирующих усилия ученых разных специальностей, не будут оформлены контуры их унификации. Несмотря на мощь экспериментальной базы и престижность когнитивных исследований, научные сообщества, просто во избежание оказаться очередным провальным проектом постмодерна, вынуждены наследовать опыт позитивистских волн XX века и все так же заниматься шлифовкой «метаязыка» когнитивных наук. Пространство междисциплинарного диалога требует не только выдвижения аксиом универсальной структуры человеческой когниции, что уже делает задачу несоизмеримо трудоемкой, но и обоснования ее достаточности к разнообразным приложениям: когнитивным

принципам, системам, процессам развития. К сожалению, сейчас на это качество не могут претендовать широко обсуждаемые языковые модели – ни *lingua mentalis* Дж. Фодора, ни *semantic primitives* А. Вежбицкой, ни *lingua innate* Н. Хомского, ни его *background* в интенциональной интерпретации у Дж. Серля или эволюционирующей форме у Д. Деннета. Многие из указанных концептов, как и многие здесь не упоминаемые, эвристично описывают одни феномены сознания и совершенно бесполезны при объяснении других. Многие моменты остаются неразрешенными и в новых перспективных языковых моделях, выверенных уже процессами дарвинистской адаптации, как в случае распараллеленных генеративных структур Р. Джэкендоффа (фонология, синтаксис, лексикон, семантика), связанных между собой интерфейсами [Jackendoff, 2002]. Новый универсальный язык когнитивных наук, формализующий способность к абстрактному мышлению, рекурсиям, семиозису высшего порядка, формированию концептов, планированию действий, должен быть достаточно гибок к репрезентации рефлексии, открытости системы в целом, феноменологии сознания, вторичных моделирующих систем (искусства, культура). Унифицированный языковой инструментарий должен обладать достаточной функциональной мощностью, чтобы наряду с процессами нейрофизиологической экономии предполагать

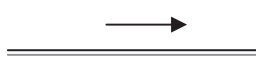
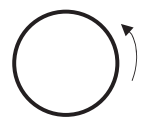
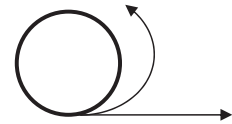
1) Конфигурационный примитив Платона <i>синавгия (συναγωγία, «слияние лучей»): в результате слияния огневых лучей, истекающих от глаз и от видимых предметов, возникает связанное зрительное тело, лишенное физических свойств</i>		<i>линия</i> (когнитивная интенция)
2) Конфигурационный примитив Аристотеля <i>энтелехия (ἐντελέχεια) – движение, содержащее цель в самом себе, душа – энтелехия тела, характеристика живого есть движение к своему телу, неорганические вещества, лишённые энтелехии, не вполне тела</i>		<i>окружность</i> (рекурсивная интенция)
3) Конфигурационный примитив стоиков <i>Постигающее представление (καταληπτική) – ведущее начало души, пневма, простирающаяся от ведущего начала к органам чувств. Тоническое колебание пневмы задаёт движение к центру (активный план, схватывание) и от центра (пассивный, восприятие)</i>		<i>пневма</i> (пневматика рекурсивной и когнитивной интенций)

Таблица 1.

собственную нейроэволюцию. Должны быть созданы языковые правила игры, одинаково ясные и понятные для всех.

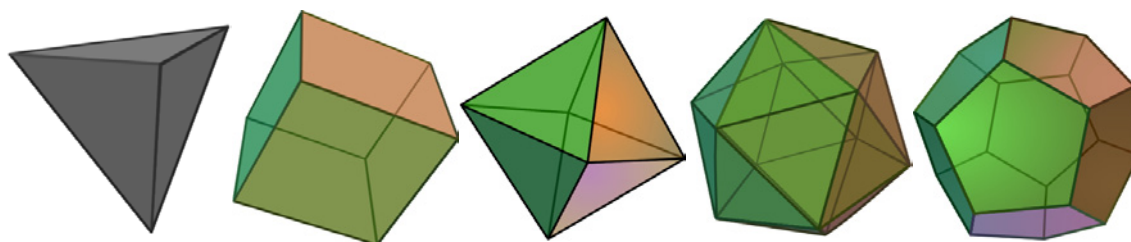
«**Интенциональная геометрия**» как претендент на универсальный язык когнитивных наук. Согласно Канту, нет ничего в структуре действительного мира, чего б уже не было в структуре нашей чувственности. Невыясненная природа языка вынуждает обращаться к биологическому натурализму, допуская свойства сознания, которые невозможно объяснить в физических терминах. В XX в. применение интенциональности к проблеме априорного синтеза породило феноменологию жизненного мира человека. Но в *жизненном мире* Гуссерля, как и в *физической монадологии* Канта, онтологический статус языка оставался достаточно размытым. Причиной послужили незаконченные попытки философов соотнести cogito человека с аксиоматическим языком геометрии. Ныне на базе когнитивных наук появляется возможность закончить начатое, онтологически совместив интенциональность с полем геометрических конфигураций. Проект унификации языка когнитивных наук может быть назван «интенциональной геометрией». Такой необычный подход, имея за плечами мощный эпистемологический фундамент прошлого и настоящего – от аксиом Евклида до современной теории струн, – сохраняет для когнитивных дисциплин преимущества

универсального языкового представления. Эволюционирующая из своих собственных проблем, геометрия есть аксиоматически выверенная, открытая система. Абстрактность, рекурсивность, формализация, прогноз – абсолютно ей не чужды.

Конфигурационная разница геометрических примитивов интенций [см. Таблица 1], исчерпывает затянувшуюся дискуссию Серля и Деннета на предмет интенциональности *живого* и *неживого*.

В средневековом номинализме Н. Орема: «интенция есть некоторая интенсификация качеств при восприятии. Тела обладают действительностью и силой в результате естественного образования фигур активного качества. Проводя аналогии с *кубом Неккера*, геометрическая конфигурация правильных тел Платона (тетраэдр-огонь, гексаэдр (куб) – земля, октаэдр-воздух, икосаэдр-вода, додекаэдр-эфир) – «не видимое глазу», интенциональное восприятие стихий.

Исключительно интересны в связи с этим идеи Ж. Пиаже, о соотношении онтогенетического развития логики с усложнением геометрических представлений. В 2008 г. в рамках гипотезы об интенциональной геометрии было обосновано когнитивное представление человека как узла интенций, замыкающихся в пространстве и развязывающегося под действием



времени, смерть как тривиальная сеть, конечный результат действия времени [Шарыпин, 2008]. Достаточно интересные корреляции обнаруживаются при соотнесении аксиом интенциональной геометрии с языком *физики узлов, зацеплений и кос*, формулируемом при помощи конфигурационной геометрии.

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ОПЕРАЦИОНАЛЬНАЯ ПРИРОДА ВИЗУАЛЬНЫХ РЕПРЕЗЕНТАЦИЙ МАТЕМАТИЧЕСКИХ ПОНЯТИЙ

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Проблема формы существования мысленных образов в сознании субъекта является одной из самых запутанных в когнитивной психологии (Величковский, 2006), способ взаимосвязи образных явлений и абстрактного знания, понятий, на данном этапе неясен для когнитивной психологии (Murphy, 2002).

Особенно остро вопрос о природе визуальных репрезентаций математических понятий стоит в психологии математического мышления и образования. В области математики, зрительно-пространственные модели являются не просто продуктами индивидуального воображения, но конвенциональными формами существования математического знания. Современные тенденции заключаются во все большем распространении визуальных методов в преподавании. Необходимость пространственных моделей для полноценного усвоения математических понятий многократно подчеркивается в работах, например, R. Duval и A. Gagatsis.

Ведущий исследователь проблемы визуализации в математике N. Presmeg (2006) четко разводит, с одной стороны, индивидуальные образы и пространственные процессы, а с другой – конвенциональные формы представления математического знания, схемы, используемые в обучении (т.н. инскрипторы). С нашей точки зрения, принципиально не просто развести эти явления, но выявить специфику мысленного образа как репрезентирующего понятие, в отличие от мысленного образа или инскриптора, сопровождающего понятие, но не вскрывающего его сути. Это ведет к принципиальному пересмотру представления о природе мысленного образа.

Goldin (2008) говорит о двойственности репрезентаций, о неоднозначности их интерпретаций и зависимости от контекста; однако репрезентация – это, по-прежнему, паттерн, который будет воспринят так или иначе в зависимости от контекста. Более категорично репрезентации рассматривает G. Vergnaud, как «динамическую активность, функциональный источник, регулирующий и организующий действия и восприятие, ... а также продукт этих действий и восприятия» (Vergnaud, 2009, р. 93 цит. по Rivera, 2011, р. 40). Эти высказывания указывают на необходимость включать процессы интерпретации в саму репрезентацию, рассматривать ее как операциональное образование. В традиции отечественной психологии (работы В. В. Давыдова) это означает, что следует предполагать понятие, как способ действия, предшествующий восприятию той или иной знаково-символической модели. Только при таком восприятии будет вскрыт репрезентирующий характер данной модели и построен мысленный образ, репрезентирующий понятие.

Отсюда, **гипотеза 1**: сама по себе пространственная конвенциональная модель не репрезентирует соответствующее ей математическое понятие и не способствует его усвоению в ходе обучения. Под конвенциональными моделями подразумеваются такие изображения, которые, с точки зрения математического сообщества, позволяют наилучшим образом в пространственной форме отразить суть понятия. Однако являются ли такие модели репрезентирующими для студентов?

Серия 1. Студентам (выборка 79 человек) читалась лекция по основам бинарных отношений. В экспериментальной группе материал сопровождался стандартными, общепринятыми для изложения данной темы *графиками*

(пространственными схематизациями формальных отношений). В контрольной группе изложение шло на формальном уровне с использованием несхематизированных примеров. Качество усвоения лекции проверялось в ходе решения тестовых задач. Результаты в группах сравнивались с помощью программы SPSS 14.0 по критерию Стьюдента.

Результаты первой серии показали, что предъявление зрительно-пространственных конвенциональных моделей математических понятий не ведет к улучшению усвоения математических понятий ($t=0,435$, $p=0,665$). То есть зрительно-пространственные модели не репрезентировали понятия для студентов (что соответствовало нашей гипотезе).

Гипотеза 2: конвенциональная модель становится репрезентирующей математическое понятие, только если включается в адекватные действия по ее восприятию и использованию в контексте данного понятия.

В серии 2 студентам читалась одна лекция, однако материалы, просматриваемые студентами на персональных компьютерах во время лекции, варьировались: с *графами* и без. Для проверки второй гипотезы половине студентов перед изложением основного содержания лекции давалась серия задач, направленная на то, чтобы научить их «пользоваться» графами, изображающими бинарные отношения. Всего в этой серии приняли участие 40 человек.

Проведенный двухфакторный дисперсионный анализ показал, что имеется взаимодействие фактора предварительного обучения работе с графами и фактора наличия графов в материалах лекции ($F=5,1074$ $p=0,030$). Если графы в лекции не использовались, то проведение предварительного обучения работе с графами только ухудшает результаты усвоения. Если же в лекции используются графы, то они помогают усвоению именно в том случае, когда есть предварительное обучение тому, как их воспринимать и использовать. То есть графы становятся репрезентирующими математические понятия только при условии включения их в адекватные действия.

Выводы:

Наши эмпирические данные и теоретический анализ позволяют предполагать, что визуальная репрезентация математического понятия неотделима от способов ее восприятия и использования и не может считаться репрезентирующей, будучи представлена только в виде статичного мысленного образа или изображения. Это положение позволяет иначе отнестись к разделению визуальных репрезентаций на внутренние (мысленные образы) и внешние (инскрипторы), предложенному N. Presmeg (2006). В контексте изучения мысленных образов как репрезентаций каких-либо математических отношений (в том числе понятий) существенно не отделение образа от материального носителя, а рассмотрение образа как предполагающего определенные способы действия и восприятия, не как статичное образование.

В более широком контексте когнитивной психологии наши данные говорят в пользу представления об образной репрезентации как об операциональной структуре, что характерно для работ таких авторов, как У. Найссер, З. Пилишин. Выявление операциональной природы не только визуальных репрезентаций, но и других способов представления понятий ведет к преодолению разрыва между понятийными и образными формами знания.

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ЧАСТОТНОСТЬ УПОТРЕБЛЕНИЯ МЕСТОИМЕНИЙ ПО ДАННЫМ КОРПУСА GOOGLE BOOKS С ТОЧКИ ЗРЕНИЯ КОГНИТИВНОЙ ЛИНГВИСТИКИ

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Каждый язык отражает определенный способ восприятия и устройства мира, вследствие чего формируется языковая картина мира индивида и нации в целом. Класс местоимений, представляющий собой одну из неоспоримых языковых универсалий, напрямую связан с речевой ситуацией и человеком как центром коммуникации, поэтому представляет особый интерес для когнитивной лингвистики.

Класс личных местоимений любого языка отражает определенные когнитивные механизмы, связанные с категоризацией мира на три класса сущностей: субъект/объект/предмет речевой ситуации, где точкой отсчета является субъект восприятия мира (Кравченко, 1992).

Целью работы является выявление динамики употребления личных местоимений первого лица именительного падежа английского (британского и американского вариантов) и русского языков, как индикатора изменений, происходящих в социуме. Приоритет изучения указанных местоимений обоснован интересом к субъекту, познающему мир, к осознанию им своего места в культурном пространстве (S. Han and G Northoff 2008: 646–654).

Большие возможности исследований в этом направлении открылись с появлением электронной библиотеки Google Books и средств для подсчета частоты встречаемости слов – Ngram Viewer (Michel et al. 2011: 176–182). Google Books содержит большой корпус текстов английского

и русского языков. Для представленного нами анализа были использованы данные за период с 1800 по 2009 год.

Анализ частоты встречаемости личных местоимений *я/мы* и *I/we* в корпусах текстов исследуемых языков представлен на графике.

Общей тенденцией для исследуемых языков является то, что большая часть изменений частотности употребления указанных местоимений приходится на двадцатый век, так как в этот период происходили резкие социальные и соответственно языковые изменения (T. Säily, T. Nevalainen and H. Siirtola. 2011). Как видно из графика, на протяжении большей части двадцатого века, в частности, до 80-х годов, общей тенденцией для обоих вариантов английского языка являлось снижение частоты употребления местоимений *I/we*. С начала 80-х годов наблюдается следующее. В то время как в британском варианте английского языка данная тенденция сохраняется, и темпы падения даже несколько увеличились, в американском варианте английского языка падение сменилось ростом, особенно резким в последние годы.

Что касается русского языка, на протяжении девятнадцатого века наблюдается неизменная частота употребления местоимений *я/мы*, а начиная с 1917 года, происходит сильное падение частоты употребления вышеуказанных местоимений. Исключением являются годы Великой Отечественной войны, когда наблюдается резкий всплеск употребления частоты местоимения *я*. Минимум частоты употребления местоимений *я/мы*, приходится на 1977 год, после чего появляется тенденция к его повышению. Наибольший рост частоты использования *я/мы*

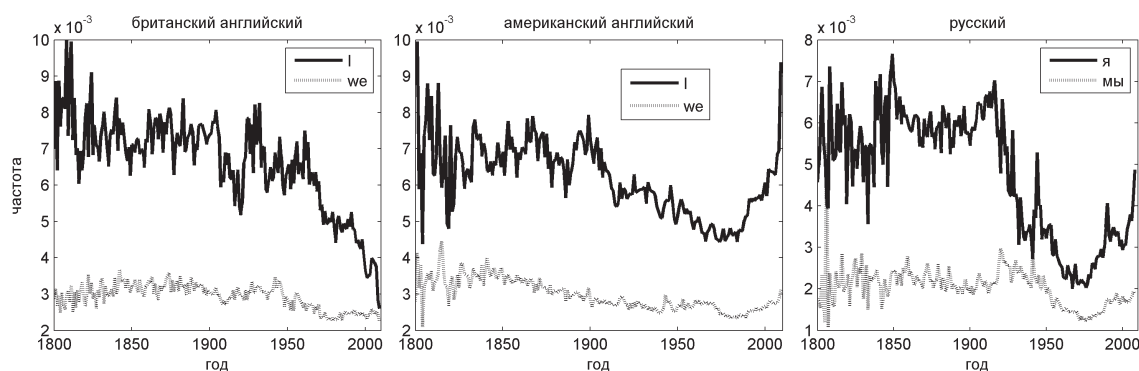


Рисунок 1. Частоты личных местоимений в английском (британский и американский вариант) и русском языках в период 1800–2008 гг.

приходится на годы перестройки и начало двадцать первого века.

Немаловажно отметить соотношение доли употребления местоимений *I* и *we*, а также *я* и *мы* в английском и русском языках. В британском варианте соотношение частоты использования местоимений *I/we* носит стабильный характер и лишь незначительно увеличивается в последнее десятилетие двадцатого века. В американском варианте английского языка наблюдается противоположная тенденция: частота употребления местоимения *I* все более возрастает, а *we* — падает. В русском языке в течение советского периода наблюдается более высокая доля употребления местоимения *мы*, с 1975 года начинает падать и к настоящему моменту приближается к дореволюционному уровню.

Возможным объяснением вышеуказанных тенденций являются следующие социальные факторы. Увеличение частоты употребления местоимения *I* в американских текстах служит развитием индивидуализма и эгоцентрической направленности общественной мысли в США, начиная с 1970 годов двадцатого века. Местоимение *I*, а не *we* начинает превалировать в письменной речи.

В британских текстах общий спад употребления местоимений *I/we* может означать постепенный уход британской общественности от прямого выражения мысли, избегание высказываться прямо, от первого лица. Стереотип высококультурной британской нации находит свое отражение в письменных источниках.

Что же касается русского языка, то спад частоты употребления местоимения *я* после

1917 года может служить индикатором коллективизации общественной мысли, размыванию границ отражения индивидуального восприятия окружающей реальности. В годы Великой Отечественной войны акцент вновь смещается на употребление местоимения *я*, так как личный опыт переживания тех лет выходит на первый план. В поствоенный период коллективное начало начинает снова превалировать, что способствует резкому смещению частоты употребления указанных местоимений в сторону *we*. В конце 80-х годов, в постперестроечное время, идеи демократизации и индивидуализации общества находят свое отражение в языке, увеличивая долю местоимения *я* в письменной речи.

Таким образом, динамика употребления личных местоимений первого лица именительного падежа английского (британского и американского вариантов) и русского языков может служить индикатором общественных изменений, находящих свое отражение в языке.

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КОНЦЕПТУАЛЬНАЯ СИМВОЛИКА ЦВЕТА «КРАСНЫЙ» ВО ФРАЗЕОЛОГИЗМАХ СОВРЕМЕННОГО АНГЛИЙСКОГО ЯЗЫКА

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На символику основных цветообозначений в английском языке (как и во многих других языках) повлияло физиологическое восприятие разных цветов, исторические события, культурные традиции, соотнесение цветообозначений с конкретными реалиями, окрашенными в эти цвета.

Красный цвет является амбивалентным, с одной стороны, он связан с активным мужским началом, это цвет жизни, энергии, импульса,

эмоций, страсти, любви, радости, праздничности, жизненной силы, здоровья, физической силы и молодости. С другой стороны, он является символом огня, войны, агрессии, опасности. Одно из значений красного цвета связано, во-первых, с чисто физиологической реакцией организма, как указывает А. Вежицка в работе 1995 г. (из-за *стыда или смущения, а иногда — гнева*), а во-вторых — с психологическим признаком, ассоциирующимся с чем-либо недостойным, неприличным, безнравственным, позорящим (*red faced, red as a beetroot/fire, go/blush red, have a red face, give someone a red face*) — это рассматривается в работах Гросса 1981, Кея и МакДениела 1978. Красный цвет

присутствует во фразеологических сочетаниях как символ *опасности* (*red alert, red flag, red light, Red List, give a red light, see the red light*), *отрицательных эмоций* (*red flag, red flag (red) before a bull, red-hot, see red*).

В символизме красного цвета присутствует и негативный аспект – этот цвет иногда связывали со злом, особенно в египетской мифологии, где красный цвет был цветом бога войны Сета. Как цвет возбуждения, он также связан со сферой секса, например, с фаллическим культом Приана в Древней Греции и с «блудницей в багрянном» (*scarlet woman*). Более часто, однако, символизм этого цвета носит позитивный характер. В первобытных ритуалах охра (красная минеральная краска) использовалась, чтобы «вписать жизнь» в мертвых, изобразить умерших людей полными жизни и энергии. Даже в христианстве, где красный цвет – в основном символ самопожертвования Христа, он был также цветом эмблемы воинов Господа – крестоносцев, кардиналов (*red hat*) и паломников. Праздники и дни святых отмечены в календаре красным цветом, что стало основанием для появления выражения *red letter day*, т.е. «красный» является символом *радости* (*red letter day, to paint the town red*). Также «red» выступает как символ *коммунизма* (*better red than dead, to redbait, reds under beds*). В английской культуре красный цвет имеет немаловажное значение. Красный флаг в Британском военно-морском флоте существует с 17 века и символизирует «вызов на бой». Национальная эмблема Англии – красная или алая роза. Автобусы и телефонные будки в Англии красные, мундиры английских солдат красного цвета (*red coat*). Для всего общества в целом красный цвет является, пожалуй, наиболее значимым и символическим цветом.

Рассмотрев символику некоторых цветов в английском языке, мы считаем необходимым определить идеализированные когнитивные

модели, лежащие в основе образования значений фразеологических единиц. Анализируя эти концептуальные схемы, мы выявили два типа *проецирования* значений цветообозначений, входящих в состав ФЕ: метафорическое и метонимическое. Как показал анализ, ведущим типом проецирования значения фразеологических единиц, содержащих компонент «цвет», оказалась метонимизация. Нами были выделены следующие концептуальные схемы:

RED

Концептуальные метонимии: RED STANDS FOR DANGER/WARNING, RED STANDS FOR EMBARRASSEMENT, RED STANDS FOR ANGER, RED STANDS FOR BLOOD (THE PART FOR THE WHOLE metonymy), RED STANDS FOR LACK OF MONEY (THE PART FOR THE WHOLE metonymy), RED STANDS FOR JOY AND FESTIVAL, RED MARKS IMPORTANCE, RED STANDS FOR CATHOLIC CHURCH, RED STANDS FOR BUREAUCRACY, RED STANDS FOR COMMUNISM.

Концептуальные метафоры: RED / SCARLET IS PASSION / SEX, RED IS HOT, RED IS COOL.

В результате проведенного анализа мы пришли к выводу о том, что большинство цветов, входящих в состав представленных ФЕ, развивают свое переносное значение на основе тех прототипов, которые издавна вызывает тот или иной цвет в нашем сознании, для цветообозначения red это – кровь, опасность, огонь, возбуждение.

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КОГНИТИВНАЯ СОЦИОЛОГИЯ О ПРИНЦИПАХ СВЯЗИ КОГНИТИВНЫХ И СОЦИАЛЬНЫХ ФЕНОМЕНОВ

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Актуальность когнитологической проблематики обусловлена тем, что познание становится главной характеристикой современного мира, и это предполагает определение не столько

его онтологического смысла (что познается), сколько эпистемологического (как познается). Когнитивная наука (когнитология) – междисциплинарное научное направление, объединяющее философию (теория познания), когнитивную психологию, нейрофизиологию, когнитивную антропологию, когнитивную лингвистику, теорию искусственного интеллекта. Однако в последние два десятилетия

когнитология расширила свое проблемное поле и наряду с развитием этих традиционных направлений когнитивных исследований происходит формирование новых. Например, в 1997 году появилось исследование Е. Зерубавела (1), посвященное обоснованию предметного поля и дисциплинарного статуса когнитивной социологии. На его взгляд, предметным полем когнитологии являются универсальные закономерности мышления, индивидуальные особенности интеллекта исследует когнитивная психология, а когнитивная социология выявляет и изучает социальные обусловленные особенности процессов мышления и восприятия информации.

При общей тенденции к исследованию социальной обусловленности мышления и выявлению системных связей между мыслительными процессами и социальными формами фундаментальной проблемой когнитивной социологии является установление характера данной связи. Первоначально эта проблема была поставлена в рамках социологии знания, тематика которой рассматривается многими исследователями как раздел когнитивной социологии и когнитологии. В классической социологии декларировалась полная изоморфность (т.е. соотносительность свойств) структуры знания и социальной структуры. Например, Э. Дюркгейм выводил некоторые когнитивные аспекты разума из социального и рассматривал категории и абстрактные идеи как производные от социального порядка. Попытку установить отношения между социальными условиями, типом принадлежности к социальной форме и теоретическими концептами предпринял Г. Зиммель, доказывавший наличие параллелизма между знанием (образованием понятий и способами интеллектуального схватывания) и социальными условиями существования, утверждая, что социокультурные изменения фундируют появление определенных концептов и интеллектуальных ориентаций и наоборот. Поскольку в категориях содержится не только субъект-объектное, но и субъект-субъектное отношение, Г. Зиммель попытался обнаружить в категориальных формах и формальных свойствах разума общественные отношения, задающие масштаб отношения к внешнему миру. Однако Г. Зиммелю удалось избежать преувеличений дюркгеймовского изоморфизма и социологизма, так как он связывал социальные условия и знания отношением взаимной причинности и считал, что социальные формы нужно рассматривать как результат наших представлений или «продуктов души». (2)

На более позднем – парадигмальном этапе развития социологии знания (термин был

введен М. Шелером в 1920-е годы) центральной проблемой являлась проблема возможности независимого от социального влияния знания. Однако вопросы, касающиеся автономии знания, были практически исключены из контекста методологии и исследование сосредоточилось на социологической импликации термина «знание». История этой дисциплины является историей различных её определений, наиболее общим из которых является утверждение, что предметом социологии знания является взаимосвязь различных форм человеческого мышления и социального контекста, в рамках которого оно возникает, однако формы и характер этой взаимосвязи в социологии знания определялись по-разному.

М. Шелер считал, что общество определяет только круг идей, теорий и других «идеальных факторов», а само содержание идей независимо от «реальных факторов» (социально-исторического контекста) и недоступно социологическому анализу. Определение социологии знания К. Мангейма было более широким по сравнению с интенционально ограниченной моделью М. Шелера и отличается от него (при конгениальном подходе) иным систематическим контекстом. Согласно Мангейму, общество детерминирует не только возникновение, но и содержание человеческих идей, за исключением математики и части естественных наук. В эпистемологию и историческую социологию Мангейм включил теорию идеологии, утверждая, что ни одно человеческое мышление не свободно от идеологизирующего влияния социального контекста, что знание всегда должно быть знанием с определенной позиции. Большое значение он уделял анализу моделей мышления, на которые имплицитно ориентируется субъект при изучении объекта, указывая на их связь с социальным положением определенных общественных групп и их интерпретацией мира.

В последующих исследованиях теорию К. Мангейма стали называть «радикальной» концепцией социологии знания, в отличие от «умеренной» М. Шелера, а дальнейшее развитие этой дисциплины представляет собой модификацию этих двух концепций. (3: 24) Однако радикальная концепция, сформированная К. Мангеймом, отказалась от концептуализации и дальнейшего развития принципа обобщенного взаимодействия Г. Зиммеля, характеризующего смысл связей между мыслительными процессами и социальными формами. Традиционным в исследовании феномена отношений между социокультурным окружением и научным знанием становится причинный тип связи, для которого

характерно предшествование во времени первого явления другому и порождение одного другим, хотя разработанный Г. Зиммелем принцип обобщенного взаимодействия обладает большей эвристической значимостью и учитывает те взаимосвязи, которые линейная причинность оставляет в тени.

Не вдаваясь в существо и подробности определения причинной связи, отметим, что в рамках детерминизма существуют другие типы отношений, такие, как «связь состояний», зависимость от условий, коррелятивные связи и синхронизация, которые не предполагают предшествования во времени и обязательного порождения, но, не будучи каузальными, тем не менее, не являются случайным совпадением.

Обращает на себя внимание близость идеи синхронизации как к разработанному Г. Зиммелем принципу обобщенного взаимодействия, так и к концепции самоорганизации и динамики систем. Дальнейшая разработка проблемы взаимосвязи между мыслительными процессами и социальными формами позволит когнитивной социологии расширить рамки эпистемологических и логико-методологических проблем и найти новые возможности применения когнитивного подхода к социологической проблематике.

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АЛГОРИТМ ИДЕНТИФИКАЦИИ ИЗОБРАЖЕНИЙ В БИОЛОГИЧЕСКОЙ И ИСКУССТВЕННОЙ РАСПОЗНАЮЩИХ СИСТЕМАХ

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В последнее время очень активно ведется разработка алгоритмов распознавания образов (<http://face-rec.org/algorithms/#ICA>). Одним из вариантов применения этих алгоритмов является их использование в системах машинного зрения. Человек достаточно успешно справляется с проблемой распознавания, поэтому использование функциональной схемы, аналогичной биологической, было бы целесообразно. Целью данной работы было сравнение алгоритмов и эффективности опознавания объекта по изображению в искусственной и биологической системах. Для сравнения использовались траектории

осмотра изображения в двух контекстах: при обучении и при идентификации лица человека. Движения глаз человека регистрировались с помощью EyeTracker iView X™ Hi-Speed 1250.

Движения глаз человека в процессе обучения и идентификации

В ходе эксперимента испытуемому было предложено по пяти предъявленным изображениям лица одного и того же человека запомнить его (сформировать класс «свой») для последующей идентификации при последовательном предъявлении 32 изображений разных людей. При этом для сравнения были выбраны изображения, трудноразличимые с точки зрения технической системы. Стимульный материал для запоминания предъявлялся на 30 секунд каждое изображение. Сначала распознавание, то есть отнесение предъявленного изображения либо к классу «свой», либо к классу «чужой»,

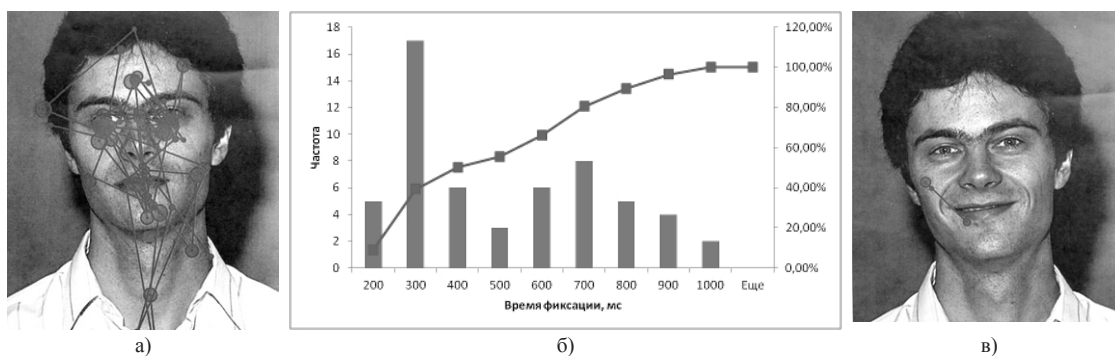


Рис. 1 Запоминание и идентификация объекта. а) графическое представление местоположения и длительности фиксации; б) гистограмма времени фиксации; в) траектории движения глаз человека при идентификации.

происходило в режиме, когда испытуемый не был ограничен во времени. Во второй части эксперимента тот же стимульный материал предъявлялся только на 125 мс каждое изображение.

Проведение эксперимента на EyeTracker iView X™ Hi-Speed 1250 позволило выявить некоторые внешние признаки, характеризующие процесс распознавания изображений лиц человеком.

На этапе обучения (рис. 1а) количество точек фиксации составляет в среднем 50–60 точек. Среднее время фиксации составляет 461 мс, что свидетельствует о фокальном, или внимательном, анализе изображения (Б. М. Величковский, 2006).

На этапе идентификации количество точек фиксации составляло в среднем 1–2 точки (рис. 1в). Положение этих точек не совпадало с положением точек фиксации при обучении. При идентификации стимульного материала в виде потока изображений со временем экспозиции каждого кадра порядка 125 мс местоположение точки фиксации практически не меняется от кадра к кадру, то есть распознавание происходит без осматривания изображения. Можно предположить, что в основе распознавания лежит не движение глаз, а движение «мысленного взора», то есть осмотр внутренней модели.

В проведенном нами эксперименте выяснилось, что, несмотря на то, что изображения для сравнения с эталоном (образом, который предлагалось запомнить) были подобраны похожими с точки зрения технической системы, человек достаточно успешно справлялся с процессом классификации «свой» – «чужой». Для успешного распознавания человеку было достаточно 125 мс, что позволяет говорить о режиме амьентной обработки изображений при идентификации. И лишь в том случае, когда человек затруднялся с ответом, можно было увидеть времена фиксаций, характерные для «внимательного» осмотра. Таким образом, можно выделить два режима работы при распознавании: быстрое в амьентном режиме и «внимательное» (медленное) в фокальном режиме.

Алгоритм идентификации объекта по изображению в искусственной распознающей системе

Алгоритмы распознавания, реализованные в нашей группе, основаны на методе главных

компонент (М. Turk and A. Pentland. Eigenfaces for recognition. *Journal of Cognitive Neuroscience*, 3:71–86, 1991). При этом в качестве кодов используются вектора проекций изображений на заранее сформированное пространство признаков невысокой размерности.

На этапе обучения происходит формирование образа или модели объекта. Признаки вычисляются не только точно в области расположения лица, но и в некоторой его окрестности D:

$$D: \begin{cases} -\frac{eyedist}{16} \leq x - x_0 \leq \frac{eyedist}{16} \\ -\frac{eyedist}{16} \leq y - y_0 \leq \frac{eyedist}{16} \end{cases}$$

где eyedist – расстояние между глазами человека на изображении, x, y, x_0, y_0 задают координаты левого верхнего угла смещенного и точного положения прямоугольника, описанного вокруг области лица на изображении. Таким образом, с точки зрения технического устройства модель объекта (лица человека) представляет собой набор векторов признаков (обычно 60–100 векторов).

На этапе идентификации строится модель нового изображения по тем же признакам, которые вычислялись при обучении. Идентификация основана на оценке расстояния между моделями объектов в признаковом пространстве. При значении расстояния в диапазоне $d < k_1$ и $d > k_2$ принимается решение «свой» или «чужой» соответственно (аналогично амьентному режиму). При значении расстояния в диапазоне $k_1 \leq d \leq k_2$ вычисляются дополнительные признаки для этого изображения, и уже на основе этих данных принимается окончательное решение (аналогично фокальному режиму внимания).

Выводы

1. Ошибки классификации «свой» – «чужой» в биологической системе меньше, чем в искусственной;
2. В биологической и искусственной распознающих системах реализовано два режима работы при распознавании: быстрое в амьентном режиме и «внимательное» (медленное) в фокальном режиме;
3. В отличие от искусственных систем, человек способен идентифицировать изображение по признакам, не фиксируемым в процессе обучения.

СОЦИАЛЬНЫЙ ИНТЕЛЛЕКТ И ПРЕДСТАВЛЕНИЯ О ЗНАЧИМЫХ ДРУГИХ

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Как известно, социальный интеллект – это понятие, которое вошло в современную психологию усилиями таких авторитетных исследователей, как Э. Торндайк, Дж. Гилфорд, Н. Кантор и др. Э. Торндайк, автор первой концепции социального интеллекта, трактовал его как способность понимать и управлять другими людьми. Основной функцией социального интеллекта Торндайк считал прогнозирование собственного поведения и поступков других людей.

Анализ современной литературы по проблемам социального мышления и интеллекта подтверждает идеи Торндайка и позволяет констатировать, что изучение социальных знаний – одна из ключевых проблем современных исследований этого явления. Многие авторы указывают, что исследование социального интеллекта предполагает конструирование разнообразных систем декларативных и процедурных описаний той или иной предметной области (Н. Кантор, Дж. Килстром, С. Вайс, С. С. Белова и др.).

На основе анализа литературы мы выдвинули предположение о тесной связи социального интеллекта со знаниями и представлениями об особенностях межличностных взаимоотношений с наиболее важными и значимыми партнерами по общению. Как известно, термин «значимый другой» был предложен американским психотерапевтом Г. Салливаном и служит для обозначения человека, имеющего важное значение для жизни личности. Современные представители когнитивного направления в социальной психологии (М. Болдуин, С. Чен, С. Андерсен и др.) указывают на большую роль имплицитных представлений о значимых других (SO representations) в процессах социального взаимодействия.

В нашем корреляционном исследовании проводилось сопоставление уровня

социального интеллекта и точности оценок межличностных взаимоотношений студентов со значимыми другими: отец, мать, однокурсник, преподаватель, староста. Для измерения социального интеллекта использовалось 20 конфликтных ситуаций, разделенных на две группы, – конфликты «студент – студент» и «студент – преподаватель». Все тестовые задания предусматривали семь вариантов ответов, оценивавшихся по семибалльной системе. Каждый исход соответствовал определенной стратегии выхода из конфликтного положения. Критерием эффективности ответов на опросник служила степень соответствия ответов каждого испытуемого с т.н. «медианным профилем», отражающим систему групповых оценок, а мерой соответствия служила евклидова метрика.

Для определения особенностей межличностных взаимоотношений использовалась методика измерения социального взаимодействия в диаде, основанная на круговой модели Лири в модификации Виггинза. Этот тест разработан зарубежными исследователями П. Марки, Д. Фандером и Д. Озером (Markey et al 2003). Степень выраженности октант оценивалась по пятибалльной системе, всего в вопроснике насчитывается двадцать четыре поведенческих индикатора. Мы перевели эту методику на русский язык и использовали её для оценки взаимоотношений студентов со значимыми другими лицами их ближайшего окружения: отец, мать, однокурсник, преподаватель, староста.

Точность оценок каждого испытуемого определялась как степень отклонения от групповых средних с помощью электронной таблицы Excel. Выборка состояла из 75 студентов дневного и заочного отделения факультета психологии Башгосуниверситета: средний возраст – 23 года, 64 женщины и 11 мужчин.

На основе непараметрического корреляционного анализа (см. табл. 1) была обнаружена статистически значимая положительная корреляция между уровнем социального интеллекта и шкалой LM, отражающей уровень теплоты и эмпатии. Полученные нами результаты можно рассматривать как подтверждение

	PA	BC	DE	FG	HI	JK	LM	NO
Социальный интеллект	0,14	0,09	0,16	0,11	-0,01	0,10	0,31	0,02

Табл. 1. Коэффициенты ранговой корреляции между уровнем социального интеллекта и точность оценок по октантам

предположений о тесной связи между социальным интеллектом и уровнем когнитивной эмпатии, выдвинутых Р. Риггио (Riggio et al 1989) и о важности адекватных социально-когнитивных моделей партнеров по общению для эффективной организации процессов социального мышления и прогнозирования.

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ИНТЕЛЛЕКТУАЛЬНЫЕ КОМПЕТЕНЦИИ В СТРУКТУРЕ КОГНИТИВНОГО ПОВЕДЕНИЯ ЛИЧНОСТИ

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Когнитивная феноменология традиционно описывается психологами с помощью таких понятий, как интеллектуальная деятельность, умственная операция, умственное действие. Однако в свете последних исследований, демонстрирующих феноменологическое и онтологическое единство интеллектуальных и личностных ресурсов человека (Осори́на, Жукова, 2011; Осори́на, Щербакова, Аванесян, 2011; Чечик, 2012), представляется более справедливым более говорить о **когнитивном поведении личности (КПЛ)**. КПЛ представляет собой систему целенаправленных когнитивных действий, привычным образом актуализирующуюся при постановке, выборе и решении познавательных задач и являющуюся отражением индивидуального склада ума конкретной личности. Одним из компонентов КПЛ являются интеллектуальные компетенции (ИК), т.е. такие паттерны КПЛ, которые проявляются при решении проблемных ситуаций и ведут к их успешному преобразованию.

Одной из целей настоящего исследования¹ стало выявление и описание наиболее типичных интеллектуальных компетенций, проявляющихся при решении различных когнитивных задач. Другой целью являлась проверка гипотезы о том, что решение когнитивных задач различных типов будет характеризоваться внутрииндивидуальной стабильностью в проявлении интеллектуальных компетенций. В процессе решения поставленных задач мы опирались на сочетание качественного и количественного исследовательского подходов.

Испытуемым (n = 15, М. и Ж., 18–22 лет) предлагалось в индивидуальном порядке решить две различные по своему психологическому

содержанию задачи. Одна из них представляла собой краткий бизнес-кейс, описывающий реальную проблемную ситуацию и сходный по своим психологическим характеристикам с задачами на креативность. В качестве второй задачи мы предлагали респондентам вспомнить и ретроспективно описать как фрагмент автобиографического нарратива сложную жизненную ситуацию, которая некогда была успешно разрешена испытуемым за счет его собственной активности. Важным условием являлось то, чтобы данная ситуация была значима для субъекта и чтобы у него на момент возникновения не было готового варианта ее преодоления.

В ходе решения каждой из задач с испытуемыми в индивидуальном порядке проводилось глубинное полуструктурированное интервью (длительностью от 45 до 90 минут), направленное на выявление эффективных способов осмысления и решения проблемных ситуаций, к которым прибегал респондент. Предварительный содержательный анализ данных позволил описать устойчивые паттерны КПЛ (интеллектуальные компетенции), которые испытуемые использовали для интеллектуальной проработки как автобиографических, так и более отвлеченных, «лабораторных» проблемных ситуаций: 1) преобразующая активность; 2) чувствительность к обратной связи; 3) умение формировать концептуальные гештальты на основе прошлого опыта; 4) параллельная разработка нескольких линий решения; 5) интеллектуальная настойчивость; 6) широта интеллектуального охвата ситуации; 7) активный сбор информации.

Очевидно, что присутствие в структуре когнитивного поведения всех семи ИК являет собой модель функционирования «идеального ума», а не отражает реальные паттерны интеллектуальной деятельности человека. Поэтому на следующем этапе работы мы проверяли гипотезу об устойчивом проявлении тех или иных компетенций в структуре когнитивного поведения испытуемых. Для этого с помощью

¹ Проведено при участии Л. И. Хаматишиной.

метода экспертных оценок был осуществлен анализ 15-ти интервью, полученных в ходе решения испытуемыми кейсов, и 15-ти интервью по сложным жизненным ситуациям. Эксперты ($n = 3$) оценивали наличие и степень проявления испытуемыми всех 7-ми компетенций согласно 4-балльной шкале М. О. Олехнович: от проявления поведения, обратного оцениваемой компетенции, до демонстрации этой компетенции на высоком уровне. Далее для сопоставления проявления ИК при решении кейса и сложной жизненной ситуации был проведен статистический анализ с применением Т-критерия Вилкоксона для двух зависимых выборок (парное сравнение рангов).

Было выявлено статистически достоверное различие в уровне проявления трех компетенций: интеллектуальная настойчивость ($Z = -2,913$; $p = 0,004$), преобразующая активность ($Z = -2,496$; $p = 0,013$) и активный сбор информации ($Z = 2,06$; $p = 0,039$). Все три компетенции отражают личностную вовлеченность испытуемого и его настойчивое желание найти решение проблемной ситуации и проявляются на достоверно более высоком уровне при разрешении сложной жизненной ситуации, чем при поиске ответа на задачу-кейс. Мы считаем, что выявленные различия объясняются большей мотивированностью испытуемых в отношении поиска решения сложной жизненной ситуации как когнитивной задачи, затрагивающей личностно значимые сферы. В то же время мы предполагаем, что проявление указанных компетенций на

базовом уровне является залогом преобразования условий любой задачи, и без их активации в принципе невозможен запуск когнитивных преобразований.

Качественная обработка протоколов интервью показывает, что анализ структуры индивидуального когнитивного поведения позволяет говорить о констелляторном проявлении нескольких ИК у одного испытуемого. Вопрос о природе подобных констелляций ИК и их взаимовлиянии остается открытым и требует более углубленного изучения. В то же время важно отметить, что описанные выше ИК подлежат развитию и могут быть целенаправленно сформированы при должном уровне рефлексивного отношения субъекта к процессу и результатам собственного когнитивного поведения.

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ПРОГРЕССИВНАЯ ЛАТЕРАЛИЗАЦИЯ ФУНКЦИЙ: МИФ ИЛИ РЕАЛЬНОСТЬ?

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Дихотическое прослушивание является надежным методом опосредованного определения профиля функциональной асимметрии мозга, а также позволяет оценить снижение функционального состояния полушарий и проследить динамику этих изменений с течением времени. Исследования в клинике с применением этого метода показали, что при очаговых поражениях мозга происходит изменение профиля «ведущего уха» (Гогитидзе

1990, Балашова и Егоров 2007, Гайфутдинова 2010, Carra and Vallar, 1992). При поражении левого полушария (ЛП) наблюдается двустороннее снижение продуктивности воспроизведения слов, сопровождающееся ростом числа ошибок – «эффект доминантности». Правополушарные поражения (ПП) мозга приводят к падению продуктивности воспроизведения слов, поступающих на левое ухо. В результате увеличивается коэффициент правого уха (Кпу) – «эффект очага». При этом большое количество специалистов в области нейропсихологии со скепсисом относятся к возможности изменения вектора ведущего полушария в результате одностороннего поражения мозга. Нас интересовала

обоснованность **идеи** динамичности, пластичности функциональной асимметрии мозга, которая постулируется авторами концепции прогрессивной латерализации функций (the continuing lateralization hypothesis) (Brown and Jaffe, 1975). Это важно для понимания закономерностей и механизмов восстановления психических функций, которые необходимо знать и понимать нейропсихологам и другим специалистам, работающим в области восстановления нарушенных психических процессов. Мы исследовали профиль мозговой речевой асимметрии у больных с поражением ЛП мозга и афазией. **Цель** работы состояла в изучении влияния одностороннего поражения мозга на перестройку его функциональной организации. Мы исходили из предположения, **гипотезы**, что, если мозг человека способен к изменению профиля функциональной асимметрии, то при одностороннем поражении мозга сохранное полушарие имеет способность компенсировать возникшие нарушения, это должно отразиться в угнетении собственных, свойственных ему функций. **Задачами** нашего исследования стали: определение профиля «ведущего уха» у больных с афазией (1); выявление наличия ПП симптомов в структуре левополушарного нейропсихологического синдрома у больных с афазией (2); изменения в структуре синдрома на разных сроках давности афазии (3). Последняя задача имела для нас особое значение, так как этот показатель редко рассматривается в нейропсихологической литературе как значимый. В исследовании приняли участие 38 больных с локальным поражением ЛП мозга и давностью заболевания от 6 месяцев до 7 лет. Больные были разделены на 4 группы: 1 группа – до 6 мес., 2 и 3 группа от 6 мес. до 1 года и от 1 года до 2 лет соответственно, 4 группа – более 2 лет. **Методика** исследования состояла в проведении дихотического прослушивания и нейропсихологической диагностики состояния лево- и правополушарных функций (Шипкова, 2002). **Результаты исследования** показали, что у всех больных с афазией отмечался нейропсихологический синдром, включающий в себя симптомы возбуждения, активации зеркальных отделов речевой зоны в правом полушарии. Так, все больные, независимо от срока давности заболевания, предпочитали стратегию «левого уха» (Клу). Ведущее левое ухо отмечалось у больных 1–4 группы 57%; 57%; 67; и 83% соответственно. 26 больных (68% выборки) показывали преимущество левого уха, и, что

нам представляется важным, прослеживалась тенденция постепенного увеличения процента общего количества больных с ведущим левым ухом на отставленных этапах болезни. При этом у больных оставалась стабильной ПП патологическая симптоматика, свидетельствующая об угнетении других зеркальных отделов речевой зоны в правом полушарии: теменно-затылочных, теменных. **Обсуждение результатов:** Представляется важным, что у исследованных больных был высокий коэффициент слуховой асимметрии, который в норме редко превышает границу в 20–25% (Тетеркина 1985, Доброхотова и др. 1994; Жаворонкова, 2009). В нашем исследовании у большинства больных при разных сроках давности заболевания отмечались высокие показатели Клу, что говорит о симптоме «игнорирования» правого уха и может рассматриваться как свидетельство изменения мозговой латерализации речи. **Заключение:** Данные говорят о подвижности функциональной асимметрии мозга, включая ранее рассматривающуюся как статичную речевую асимметрию и открывают дальнейший путь к междисциплинарным исследованиям в этой области.

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CHALLENGE КАК ЭТНОСПЕЦИФИЧНЫЙ КОНЦЕПТ-РЕГУЛЯТИВ

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Как известно, выявление этноспецифичных концептов осуществляется как на основе внутриязыкового анализа, с использованием принципов выделения ключевых слов, описанных А. Вежбицкой (2001: 35), так и в результате сопоставления с другими языковыми системами. Уже первые попытки перевода на русский язык американского слова *challenge* в названиях тематики научных конференций встретились с когнитивным сопротивлением картины мира языка-реципиента. Переводить его как «проблемы» соответствовало бы устоявшимся традициям русского научного дискурса, однако одновременно означало бы игнорировать своеобразие американского концепта. Было очевидно, что сама «проблема» занимала в его семантике скромное место стимула для трудной борьбы и победы американского индивидуума и нации в целом. Спустя более 20 лет адаптации в русскоязычной лингвоконцептуальной среде мы все чаще слышим слово «вызовы» в политическом и научном дискурсе, хотя, как показали наши исследования, простой обыватель продолжает ощущать чуждость данного концепта собственной системе мировоззренческих координат.

Исследование концепта *challenge* согласно трехмерной концепции, предложенной Е. С. Кубряковой (2004: 8), в антропоцентрической, экспланаторной и межфункциональной плоскостях, позволило нам прийти к выводу о доминантной роли данного концепта как регулятора поведенческих стереотипов американской нации. Более того, процессы глобализации и лингвокогнитивного импортирования обуславливают его ведущую роль в осуществлении концептуального и геополитического *remapping*-а мира.

Философские основы регулятивной роли данного концепта следует усматривать в работе британского историка и культуролога А. Тойнби. В своей работе под названием «Вызов-и-ответ» он разрабатывает концепцию развития мировых цивилизаций в рамках их эволюционного продвижения от вызова к ответу. К числу наиболее существенных вызовов-стимулов А. Тойнби относит стимул новых земель и стимул заморской миграции. Как известно, становление американской нации основывалось на этих двух стимулах.

Сопоставительный анализ словарных дефиниций русского слова «вызов» и английского «*challenge*» демонстрирует значительную разницу в семантике этих двух слов. В американском концепте превалирует компонент «стимула и призыва к действию», проистекающего из трудной ситуации, побуждающей индивидуума к конкурентной борьбе, в которой он использует все собственные силы, а, следовательно, развивается сам и непременно одерживает победу. О регулятивной функции, которую выполняет данный концепт в американском обществе, свидетельствует обширное деривативное семейство эвфемизмов, созданных по модели *X-challenged*: *visually challenged*, *developmentally challenged*, *physically challenged*, *follicly challenged* и т.п. В данных преднамеренных когнитивных построениях обращает на себя внимание логическая переакцентуация с проблемы на обязательность ее устранения в результате победы над ней. Выпячивание семы «вызов» как «стимул к борьбе и победе» при одновременном усечении семы «трудности, проблемы» приводит к тому, что рефлексивные усилия по осмыслению сути проблемы и средств ее решения сводятся к минимуму и заменяются неудержимым стремлением к победе. На уровне отдельных индивидуумов разрастание группы *X-challenged* определений заставляет задуматься над тем, насколько психически безопасно такое массовое лингвокодирование нации на перманентное состояние борьбы. На общенациональном и общемировом уровне сужение рефлексивного пространства между появлением проблемы и вступлением в борьбу заставляет опасаться за степень обоснованности и разумности действий, являющихся ответом на «вызов». В обоих случаях существует опасность сведения действий на основе принципа «вызов-и-ответ» на уровень безусловных рефлексов.

Свидетельствами развития данной тенденции могут служить как языковые, так и внеязыковые факты. К первым можно отнести доминирующую сочетаемость лексики *challenge* с *threats*, а также мощную эвфемистическую деривацию объектов, составляющих поле угрозы: «*Axis of Evil*», *friendly fire* и т.п. На культурологическом уровне «челленджирование» американского сознания выражается в массовом тиражировании специфической разновидности героев – таких, как супермен, бетмен, терминатор и им подобных. На геополитическом – принцип «вызов-и-ответ» обуславливает главенствующую роль США во всех военных акциях в регионах, в которых США

усматривают источник угрозы и вызова. Анализ всех уровней реализации концепта *challenge* показывает спорность утверждений об исключительно позитивной роли данного агентивно-регулятивного концепта. Заимствования на лингвоконцептуальном уровне способны приводить к насильственным изменениям в языковой картине мира страны-реципиента.

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TYPES OF SADNESS: UNIVERSAL OR LANGUAGE-SPECIFIC?

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В работах по психологии, в которых выделяются так называемые «базовые эмоции», к их числу нередко относят эмоцию, которая по-английски обозначается как *sadness*. При переводе инвентаря «базовых эмоций» на русский язык возникает проблема, связанная с тем, что в русском языке имеются по меньшей мере два претендента на роль эквивалента слова *sadness*, а именно *грусть* и *печаль*, причем их значения не полностью тождественны. Тем самым встает вопрос: *грусть* или *печаль* является «базовой эмоцией» (или таковой не является ни та, ни другая)? Можно добавить, что слова *грусть* и *печаль* входят в синонимический ряд, доминантой которого, согласно описанию Е. В. Урысон, является слово *тоска*; при этом *тоска* является специфической для русской культуры эмоцией и, по-видимому, не может претендовать на то, чтобы считаться «базовой эмоцией» (сущность *тоски* состоит в нереализованном и нереализуемом смутном и безотчетном желании чего-либо).

В поисках ответа на эти вопросы может помочь детальный семантический анализ соответствующих русских слов. Этот анализ, основанный на принципах «новомосковской школы концептуального анализа», потребовал критического обзора описания, данного указанным словам в работах Анны Вежбицкой и Е. В. Урысон. Были исследованы наиболее важные характеристики *грусти* и *печали* (в частности, продолжительность, глубина и интенсивность) и описано употребление этих слов и их производных в разнообразных контекстах. Проведенный анализ позволил сделать заключение, что основное различие языкового поведения слов *грусть* и *печаль* связано с тем, что *грусть* представляет собою преходящее настроение, которое не является жизненно важным для субъекта, тогда как

печаль – это эмоциональное состояние, обусловленное неким внешним явлением.

Грусть противопоставлена *веселью*: когда кто-то *грустен*, это означает, что он не может или не хочет *веселиться*. Соответственно, глагол *грустить* является непереходным и означает «быть в грустном настроении». Если это настроение длится долго или присуще субъекту более или менее постоянно, это необходимо выразить эксплицитно: *долго грустить, он всегда грустный*. Прилагательное *грустный* может указывать не только на настроение субъекта, но и на внешние признаки такого настроения (ср. сочетания *грустные глаза, грустное лицо, грустный взгляд* и т.п.). Кроме того, оно может метонимически употребляться по отношению к объектам (песням, рассказам, стихам, фильмам и т.п.), которые могут вызвать такое настроение.

Напротив того, *печаль* мыслится как имеющая предмет, причину, источник печали. Соответственно, глагол, образованный от слова *печаль*, имеет каузативное значение: *печалить*, а уже от него образуется «декаузатив» – возвратный глагол *печалиться*. Непосредственной причиной *печали* является мысль по поводу некоторой ситуации, которой субъект дает негативную оценку. Эту оценку можно сообщить другим людям, отсюда выражение *поделиться печалью* (невозможно **поделиться грустью*). Поскольку *печаль* предполагает отрицательную оценку и часто включает осуждение и отстраненность, *печалются* чаще о том, что произошло по вине других (тогда как *грустят* часто по поводу собственных поступков). Реплика *печально* в ответ на чье-то сообщение может маркировать отчужденный или осуждающий взгляд, тогда как фраза *это грустно* чаще выражает сочувствие. «Объективированность» *печали* проявляется и в том, что прилагательное *печальный* охотно сочетается с такими словами, как *факт, событие, обстоятельство, судьба* и т.п., почти теряя эмоциональную составляющую и сближаясь по значению с устаревающим прилагательным

прискорбный. Эмоциональная составляющая совсем исчезает в таких частотных сочетаниях, как *печально известный*, *печально знаменитый* (т.е. «известный с дурной стороны»).

По-видимому, и преходящее настроение человека, когда он *грустит*, потому что не может или не хочет веселиться, и эмоциональное состояние, вызванное реакцией на внешнюю ситуацию, которая *печалит* субъекта, имеют

между собою нечто общее. Это и дает возможность одинаковым образом обозначать их по-английски и во многих других языках (да и в русском языке *грусть* и *печаль* – близкие синонимы). Однако, говоря о «sadness» как о «базовой эмоции», важно понимать, что соответствующее английское слово скрывает за собою два разных явления, которые не должны смешиваться.

ИСПОЛЬЗОВАНИЕ ГЕОМЕТРИЧЕСКИХ ИЛЛЮЗИЙ ДЛЯ ИЗУЧЕНИЯ МЕХАНИЗМОВ ЗРИТЕЛЬНОГО ВОСПРИЯТИЯ В НОРМЕ И ПРИ ПСИХОПАТОЛОГИИ

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Одним из подходов к пониманию механизмов зрительного восприятия в норме является изучение сенсорно-когнитивных процессов при психопатологии. Шизофрения – распространенное психическое расстройство, сопровождающееся характерными нарушениями восприятия, мышления, речи, воли. До сих пор традиционно для оценки этих нарушений в основном используют качественные клинические и психологические методы, с помощью которых можно предположить наличие или отсутствие заболевания, но нельзя изучать механизмы, вовлеченные в патологический процесс. Недавние исследования показали, что дефициты ранней визуальной обработки и познавательных функций у больных, страдающих шизофренией, могут быть оценены с помощью зрительных геометрических иллюзий (Butler et al., 2008; Kantrowitz et al., 2009). Предполагается, что восприимчивость к иллюзиям больных шизофренией может быть маркером, обнаруживаемым на начальной стадии заболевания, но исчезающим или, наоборот, более выраженно проявляющимся с прогрессированием болезни. В связи с этим представляют интерес сравнительные данные о величине зрительных иллюзий Понцо и Мюллера-Лайера в норме и на различных стадиях шизофрении.

Величину иллюзии Понцо и Мюллера-Лайера определяли методом уравнивания с использованием оригинальных компьютерных программ, позволявших выводить на экран

монитора классические варианты фигуры Понцо и Мюллера-Лайера (Шошина и др., 2011). В исследованиях участвовали: 51 здоровый испытуемый (средний возраст 40 лет) и 143 пациента Краевого психоневрологического диспансера г. Красноярска, страдающих шизофренией, с диагнозом F20.0 по классификации МКБ-10 (средний возраст 40 лет), из них: в догоспитальном периоде – 50 человек (пациенты, имевшие 1–2 госпитализации), периоде ранних клинических проявлений – 37 и хронически больных, страдающих шизофренией более 10 лет, – 56 человек.

Установлено, что в догоспитальный период и на стадии ранних клинических проявлений больные шизофренией менее склонны к иллюзии Понцо, чем психически здоровые испытуемые. Тогда как хронически больные, страдающие шизофренией более 10 лет, наоборот, более склонны к этой иллюзии, чем здоровые испытуемые. При предъявлении фигуры Мюллера-Лайера наблюдали несколько иную картину. Пациенты на всех стадиях шизофрении были достоверно более склонны к иллюзии Мюллера-Лайера. Наибольшая разница в величине иллюзии зафиксирована между психически здоровыми и хронически больными (Шошина и др., 2011).

Выдвинуто предположение, что высокая чувствительность к иллюзиям у больных шизофренией по сравнению со здоровыми испытуемыми является результатом нарушений на уровне пространственно-частотной фильтрации изображения, в частности, с особенностями функционирования магноцеллюлярных и парвоцеллюлярных зрительных каналов, чувствительных соответственно к спектру низких и высоких пространственных частот. В связи с этим изображение фигуры Мюллера-Лайера было подвергнуто вейвлетной фильтрации, в результате которой получили изображения,

содержащие определенный спектр низких или высоких пространственных частот. При предъявлении отфильтрованных изображений обнаружено, что пациенты в догоспитальный период и на стадии ранних клинических проявлений, страдающие шизофренией относительно непродолжительное время, достоверно более чувствительны к иллюзии при предъявлении изображений фигуры Мюллера-Лайера, содержащих спектр высоких пространственных частот. Тогда как здоровые испытуемые – при предъявлении изображений со спектром низких пространственных частот. Хронически больные, страдающие шизофренией более 10 лет, демонстрировали большую, чем у здоровых, склонность к иллюзии при предъявлении всех изображений фигуры Мюллера-Лайера. Полученные данные позволяют предположить, что на ранних этапах развития шизофрении происходит снижение чувствительности парвоцеллюлярных зрительных каналов к оценке длины отрезков в фигуре Мюллера-Лайера, с сохранением таковой магноцеллюлярных каналов. Снижение чувствительности магноцеллюлярных каналов происходит с увеличением длительности заболевания.

Гипотетически обнаруженные различия между группами пациентов с разной длительностью заболевания могут быть связаны с нарушением при шизофрении познавательных процессов. Согласно M. F. Green с соавторами (Green et al., 2005), около 80% больных шизофренией демонстрируют дисфункцию познавательных процессов, которые, по данным R. Buchanan (Buchanan et al., 1994), хорошо коррелируют с клиническими признаками, тяжестью и

продолжительностью болезни. Результаты многочисленных исследований, представленных в обзоре A. Shrivastava и M. Johnston (Shrivastava, Johnston, 2010), свидетельствуют о том, что нарушение познавательных функций при шизофрении не является следствием положительных или отрицательных признаков, интеллектуального дефицита или влияния антипсихотического лечения. Мы предполагаем, что дефициты ранней сенсорной обработки, в частности, рассогласование в функционировании магноцеллюлярной и парвоцеллюлярной зрительных систем, коррелируют с выраженностью нарушения когнитивных функций при шизофрении и возможно, проявляются прежде, чем станут заметны дефициты познавательных функций.

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СОХРАНЕНИЕ СЕМАНТИЧЕСКОГО ОПИСАНИЯ ЭТАЛОНА В ПАМЯТИ

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Исследования памяти, выполненные в русле различных подходов: биохимического, нейрофизиологического, психофизического, экологического, социально-психологического, позволяют создать панорамную картину исследования памяти. Использование психофизического подхода к изучению памяти дает возможность системного рассмотрения данной проблемы: изучать динамику характеристик мнемического процесса, используя психофизические показатели; выявлять взаимосвязи между феноменами разного уровня.

Динамика сохранения эталона в памяти для стимулов разных модальностей исследовалась достаточно подробно в работах отечественных и зарубежных авторов (Корж, Леонов, Соколов, 1969; Корж, Зубов, Садов, 1985; Корж, 2009; Шпагонова, 2009, 2010; Magnussen, Dyrnes, 1994; Lages, Treisman, 1998; Данилова, Моллон, 2007). Показано, что наблюдатели могут хранить в памяти значительное количество эталонов и производить сравнение предъявленного физического стимула с эталоном, хранящимся в памяти, с высокой точностью. Было установлено, что с течением времени хранения эталона забывания не происходит, а наоборот, увеличивается точность опознания, различения. Полученные в лабораторных

условиях закономерности динамики психофизических характеристик кратковременной и долговременной памяти, которые проявляются в нестабильности величины субъективного эталона и одновременно в устойчивости таких характеристик, как точность различения и дифференциальные пороги, подтверждаются в естественных условиях, с включением экологического фактора – гравитоинерционных воздействий, (Шпагонова, 2010).

Проблема экологической валидности результатов является актуальной в различных областях психологической науки. Экологический подход к исследованию восприятия времени человеком реализовывался в работах В. А. Садова и Н. Г. Шпагоновой (2008). Основное внимание уделялось предметному, семантическому содержанию воспринимаемой человеком сенсорно-перцептивной информации, и ее влияния на восприятие временного интервала. Восприятие времени в задачах, приближенных к реальным, рассматривается как целостный феномен, и оценка длительности звукового процесса не складывается на последовательность дискретных событий. Экспериментальной проверке подвергалась гипотеза о связи качественного содержания естественных и искусственно созданных звуковых фрагментов и восприятия их длительности. Длительности исследуемых звуковых фрагментов находились в диапазоне от 203 мс до 3039 мс. В результате исследования был сконструирован метод для определения латентных переменных, детерминирующих описание естественных, реверсивных и тональных звуковых фрагментов по типу семантического дифференциала. Были получены следующие шкалы: 1. Недифференцированная эмоциональная оценка звука; 2. Естественность; 3. Известность; 4. Высота; 5. Резкость; 6. Сила. Показано, что эти переменные идентичны для описания естественных, реверсивных и тональных звуковых фрагментов. С наименьшей временной ошибкой воспроизводились длительности звуков, оцениваемые как естественные, известные и сильные. Длительности естественных звуков воспроизводились с меньшей ошибкой, чем реверсивные и тональные звуки (Садов, Шпагонова, 2008).

Целью данной работы является экспериментальное исследование динамических характеристик семантического описания эталона в процессе его хранения в долговременной памяти. В соответствии с целью были поставлены следующие задачи: 1. Определить структуру семантического описания эталона в процессе его хранения. 2. Выявить зависимость структуры описания эталона от длительности его хранения.

Новизна данной работы состоит в том, что, в отличие от ранее проводившихся исследований, в которых изучалась динамика физических характеристик эталона в долговременной памяти, наше исследование направлено на изучение динамических характеристик семантического описания эталона, хранящегося в долговременной памяти.

Методика. В качестве эталона был выбран звуковой фрагмент – пение птиц в лесу (2449 мс), как наиболее приятный, естественный, известный, сильный по сравнению с другими фрагментами (Садов, Шпагонова, 2008). В исследовании использовались следующие методы: семантический дифференциал (СД), направленное интервью, которое включало в себя следующие вопросы: Что это за звук? Что является источником звука? Где можно услышать этот звук, с какими событиями он связан? Какие ассоциации вызывает? Нравится ли вам данный звук? Какие эмоции вызывает?

Процедура. Данное исследование было проведено на базе экспериментально-аппаратурного комплекса зрительного и слухового восприятия человека, позволяющего воспроизводить звуки и регистрировать реакции испытуемых. Исследование проводилось индивидуально и состояло из пяти серий. В первой серии испытуемому предъявлялся эталон, который он мог прослушать несколько раз, чтобы запомнить его длительность. Далее он отвечал на вопросы направленного интервью. Затем испытуемый оценивал характеристики звукового фрагмента по пунктам СД, состоящего из 49 пар прилагательных. Каждая пара прилагательных описывает признак, выраженность которого определяется по 7-балльной шкале (–3 –2 –1 0 1 2 3). Через 20 минут после запоминания эталона испытуемый воспроизводил длительность запомненного эталона нажатием на клавишу. Вторая серия проводилась через 7 дней после первой. Задача испытуемого состояла в том, чтобы вспомнить длительность эталона, ответить на вопросы направленного интервью, заполнить бланк СД, воспроизвести длительность звука нажатием на клавишу. Следующие серии были аналогичны второй серии и проведены через 14, 21, 28 дней после первой серии.

В результате обработки бланков СД по всем пяти сериям были получены 6 шкал: 1. Недифференцированная эмоциональная оценка звука: приятный-неприятный, расслабляющий-пугающий, комфортный-некомфортный, привлекающий-непривлекающий, неустойчивый-устойчивый, нераздражающий-раздражающий, желаемый-нежелаемый, благо-

приятный-неблагоприятный. 2. Естественность звука: естественный-искусственный, природный-механический, живой-синтетический, одушевленный-неодушевленный, живой-неживой. 3. Известность звука: знакомый-незнакомый, встречаемый-невстречаемый, известный-неизвестный, обычный-необычный, стандартный-нестандартный. 4. Высота звука: высокий-тонкий, тонкий-толстый, легкий-тяжелый, острый-тупой. 5. Резкость звука: ритмичный-мелодичный, резкий-плавный, обрывистый-плавный, жесткий-мягкий. 6. Сила звука:

громкий-тихий, сильный-слабый, звонкий-глухой, четкий-размытый, яркий-тусклый.

Сравнительный анализ результатов показал, что состав шкал СД, а также среднее значение и разброс оценок по каждой шкале не изменяется в процессе хранения эталона в памяти. Это свидетельствует о том, что структура семантического описания эталона не зависит от длительности его хранения и является устойчивой характеристикой долговременной памяти.

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УЧАСТИЕ ТОРМОЗНЫХ СИСТЕМ МОЗГА В ХРАНЕНИИ КОГНИТИВНОЙ ИНФОРМАЦИИ

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Все изменения окружающей среды фиксируются в нашей памяти при условии, если они привлекают внимание и вызывают рефлекс «что такое» — ориентировочный рефлекс. По мере повторения этих изменений ориентировочный рефлекс угасает, затормаживается. Дальнейшие реакции нашего организма на это же повторное изменение среды определяются его биологическим значением. Если он не требует от нас никаких действий, он просто становится знакомым, мы его, судя по нашему поведению, воспринимаем, но как бы «не замечаем». Если на данное изменение среды требуются какие-либо действия, то вырабатывается активное поведение разной степени сложности. Но и в этом случае стимул — знаком, он не вызывает ориентировочный рефлекс. Следовательно, декларативная память, т.е. тот вид памяти, который обеспечивает в мозге хранение того, что мы знаем, фиксируется при участии процесса торможения ориентировочного рефлекса.

Формирование такого вида памяти было детально изучено в работах Е. Н. Соколова и сотрудников (Соколов, 1969). Показателем динамики процесса появления и исчезновения ориентировочного рефлекса на новый стимул служила активация ЭЭГ, снижение амплитуды альфа-ритма в коре головного мозга человека. По мере повторения стимула активация ЭЭГ исчезала. Но любое изменение его параметров (ослабление или усиление интенсивности, укорочение или продление времени действия и т.д.) приводило к

восстановлению ориентировочного рефлекса, а при повторении стимула — снова к его исчезновению. Е. Н. Соколов ввел в нейрофизиологию понятие о «нервной модели стимула», которая фиксируется в памяти субъекта при повторении раздражителей. Наличие в мозге модели нервного стимула служит процессу классификации событий среды с точки зрения, знакомы они субъекту или не знакомы.

В наших исследованиях, проведенных на бодрствующих необездвиженных кроликах при одновременной регистрации поведения, ЭЭГ, вызванных потенциалов (ВП) и активности отдельных нейронов, было показано, что при угашении ориентировочного и условного рефлексов в коре головного мозга усиливаются тормозные гиперполяризационные процессы. Этот процесс отражается вначале в локальном (проекционные структуры условного стимула) повышении амплитуды вторичных компонентов вызванных потенциалов и соответствующего им усиления фазности, чередования активации и торможения импульсации нейронов, затем, по мере углубления состояния торможения при повторении неподкрепляемых раздражителей, во все более генерализованном усилении фоновых медленных колебаний потенциала и соответствующей фазной активности нейронов в новой коре и в других структурах головного мозга. Полученные факты дают экспериментальное и теоретическое обоснование гиперполяризационной теории внутреннего торможения (Шульгина, 1987).

Тормозные гиперполяризационные процессы реализуются в ЦНС посредством тормозных интернейронов и общемозговых тормозных систем. Основным тормозным медиатором в высших отделах мозга является гамма-аминомасляная кислота (ГАМК). Следовательно, торможение

ориентировочного рефлекса реализуется посредством включения в работу реализующей его нервной сети тормозных интернейронов. Именно их активация определяет торможение ориентировочного рефлекса в ответ на знакомый стимул. Фиксация памяти о знакомых изменениях среды обитания происходит при непременном участии тормозных систем нейронов. Если изменения среды знакомы, но не требуют активных действий, то они вызывают активацию тормозных систем, локальных и общемозговых. Если незнакомы, то вызывают ориентировочный рефлекс и на уровне работы нейронов – их растормаживание (Шульгина, 2010; Шульгина и соавт., 2011).

Полученные нами экспериментальные данные и теоретические положения о механизмах хранения памяти на такое свойство раздражителя, как «знакомый» и «незнакомый», имеют и сугубо прикладное значение для клиники таких заболеваний, как шизофрения, шизотипический тип личности и т.п. При этих нарушениях в работе головного мозга страдает и вырабатываемое – «латентное» (согласно терминологии западной литературы) или внутреннее (согласно павловской терминологии) торможение, и предимпульсное, т.е. генетически обусловленное торможение. Предполагается, что это свойство

нервной системы определяет присущие таким большим симптомы, как неспособность выделить из среды значащие события, нарушения логического мышления и т.п. (см. Lubow, 1989).

В наших работах с моделью сети из возбудительных и тормозных нейроноподобных элементов было показано, что изменения эффективности не только возбудительных, но и тормозных синапсов при обучении, существенно увеличивают информационную емкость и работоспособность сети (Шульгина и соавт., 1983).

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МОДЕЛИРОВАНИЕ ТЕМПОРАЛЬНОЙ СТРУКТУРЫ СОЗНАНИЯ

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На современном этапе развития науки особую значимость приобретают исследования структуры сознания. Актуальность изучения этой сферы обусловлена многими факторами, главный из которых, на наш взгляд, – перспектива нахождения нейрофизиологических коррелятов явлений сознания. В данной области уже есть значительные достижения. Однако в силу чрезвычайной сложности этой научной задачи она еще далека от решения.

В таком контексте очевидна необходимость подходов к описанию структуры сознания, ориентированных на построение формальных моделей. Формальный аспект важен здесь потому, что для определения нейрофизиологических коррелятов явлений сознания нужно систематически исследовать свойства этих явлений.

Фундаментальным аспектом сознания и, вместе с тем, весьма трудным для изучения

является его темпоральная структура. Это сложный феномен, имеющий целый ряд аспектов, а именно:

- упорядоченность;
- продолжительность;
- направленность;
- содержательность (наличие содержания, представленного в темпоральной форме);
- единство непрерывности и дискретности (непрерывный поток сознания, основу которого составляет дискретная серия статических содержаний – *фреймов* или *кадров*);
- связь с объективным временем (в потоке субъективного опыта представляются объективные процессы, обладающие темпоральной структурой);
- универсальность (обеспечение единства всех компонентов сознания; особую роль времени в осуществлении синтезов явлений субъективной реальности подчеркивал еще Кант, что нашло отражение в понятии схематизма (Кант 1999));
- наличие таких структур, как прошлое, настоящее и будущее;

- ценностная значимость;
- и др.

Каждый из аспектов может быть описан с помощью формальных методов моделирования. В качестве примеров средств для таких подходов укажем *теорию нечетких множеств* и *паранепротиворечивую логику*.

Теория нечетких множеств может быть применена для моделирования непрерывности течения времени в сознании. Поток субъективного опыта состоит из упорядоченных во времени кадров. Однако субъект не обладает знанием ни о точном количестве кадров, представляющих тот или иной процесс в его сознании, ни об их характеристиках, достаточных для того, чтобы отличить смежные кадры друг от друга. Это обстоятельство позволяет рассматривать поток субъективного опыта как нечеткое множество.

Паранепротиворечивая логика может быть использована для моделирования комплекса таких ментальных структур, как прошлое, настоящее и будущее. Мы принимаем точку зрения Мак-Таггарта, согласно которой этот комплекс структур противоречив (McTaggart 2009), однако, в отличие от Мак-Таггарта, не делаем из этого вывода о нереальности времени. Альтернативой представлению об иллюзорности течения времени является признание реальной противоречивости данного феномена. Чтобы выявить смысл такой противоречивости, нужно ввести понятие *quasi-«теперь»*: «порция» событий,

способных «поместиться» в настоящем. *Quasi-«теперь»* соответствует объективным процессам, длительность которых приблизительно 2–3 секунды (Röppel 2009). Истинной является конъюнкция следующих утверждений:

- существует множество различных *quasi-«теперь»*, упорядоченных во времени;
- существует только одно *quasi-«теперь»*, представленное в настоящем;
- для каждого *quasi-«теперь»* верно, что оно находится в настоящем.

Система этих утверждений противоречива. Поэтому строить на ее основе теоретические конструкции можно только с опорой на неклассическую логику. Приложениями паранепротиворечивой логики являются модели изменения, движения, а также течения времени (Priest 2006).

Описание субъективного феномена течения времени является важной задачей философии сознания. Построение формальных моделей для решения этой задачи обладает, на наш взгляд, значительным эвристическим потенциалом.

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ИССЛЕДОВАНИЕ ОСОБЕННОСТЕЙ КОГНИТИВНОГО КОНТРОЛЯ В КОНТЕКСТЕ ПРЕОДОЛЕНИЯ НЕОПРЕДЕЛЕННОСТИ

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Проблема взаимосвязей когнитивных процессов и поведенческих диспозиций продолжает оставаться актуальной не только для персонологии, но выступает полем нереализованных возможностей для когнитивной науки. Определение регулирующей роли когниций в осуществлении сложных поведенческих актов, в частности, – преодолении неопределенности, составляет основной исследовательский интерес и предмет настоящей работы.

С целью выявления особенностей когнитивного контроля мы обратились к феномену когнитивного стиля. Исследования Холодной

(2002a) дают основание полагать, что когнитивные стили фиксируют не только факт индивидуальных различий в познании, но отражают сформированность механизма непроизвольного интеллектуального контроля (феномен «расщепления» полюсов стилевой оси).

Механизм непроизвольного интеллектуального контроля представляет собой относительно поздний в онтогенетическом плане класс ментальных структур, производный от структур более высокого порядка – понятийных, выступающих интеграторами и регуляторами интеллектуальной деятельности в направлении «сверху – вниз» (Холодная, 2002b).

Измерению подвергались конструкции когнитивного стиля «полезависимость/полenezависимость» (тест Встроенных фигур Виткина), «импульсивность/рефлексивность» (тест Схожих рисунков Кагана), «ригидный/гибкий

познавательный контроль» (тест Словесно-цветовой интерференции Струпа), а также диспозиции толерантности к неопределенности Баднера и МакЛейна (адаптация Солдатовой и Луковицкой соответственно), личностной и ситуативной тревожности Спилбергера (адаптация Ханина), готовности к риску Корниловой, базисных убеждений личности Янофф-Бульман (адаптация Падун, Котельниковой).

Участниками исследования выступили студенты в возрасте 17–22 лет ($M=19.4$; $SD = 1.6$), 64 девушки и 16 юношей. Использовался ex post facto дизайн. Анализ данных производился с помощью дисперсионного и кластерного анализа. Сравнение выборок осуществлялось по U-критерию Манна – Уитни.

Основной гипотезой исследования явилось предположение о том, что индивидуумы, характеризующиеся высокими индексами непроизвольного интеллектуального контроля, будут проявлять большую способность справляться с неопределенными стимулами, тогда как индивидуумы, занимающие крайние позиции на стилевом континууме, будут наиболее нетерпимыми к неопределенности.

В ходе исследования было установлено, что испытуемые с высокими показателями когнитивного исполнения заданий на обнаружение простой фигуры в сложной ($p \leq .05$) и на переключение ($p \leq .05$) демонстрируют комплекс поведенческих проявлений сопряженных со свойством толерантности к неопределенности.

Решающим фактором преодоления неопределенности в обследуемой выборке является когнитивная гибкость (величина интерференции, $F=8.74$, $p \leq .001$), эксплицирующая функцию подавления как одного из компонентов когнитивного контроля (Б. Б. Величковский, 2009).

Полученные данные согласуются с результатами исследований когнитивных стилей и феномена рабочей памяти (Grimley, Banner, 2008; Grimley, Dahraei, Riding, 2008; Nosal, 1990, цит. по: Холодная, 2002a). Так, высокая аналитичность (стиль полезависимость/полнезависимость) способствует уменьшению эффектов эмоционального напряжения на обработку информации и повышению скорости переработки информации. Унитарность/комплиментарность (стиль ригидный/гибкий познавательный контроль) как свойство когнитивного стиля влияет на регуляцию объема временного хранилища, что обуславливает рост познавательной неуверенности в связи с необходимостью переключаться с одного типа переработки на другой.

Таким образом, полученные данные позволяют заключить, что уровень селективного внимания и скорость переработки информации оказывают наибольшее влияние на процессы преодоления неопределенности, нежели уровень сформированности механизма непроизвольного интеллектуального контроля.

Исследования в области когнитивного развития и старения показали, что мощность и скорость когнитивного управления прогрессивно увеличивается до ранней взрослости, после чего наблюдается их спад (Крейк, Бялысток, 2006; Величковский, 2009). Возможно, что фактором возраста объясняется незначительное влияние функции непроизвольного контроля на регуляцию интеллектуального поведения в ситуации неопределенности, также как и факт выпадения интеллектуально непродуктивных стилевых субгрупп в общей картине «расщепления» полюсов.

Дискретные проявления действия механизма непроизвольного интеллектуального контроля обнаружены при сравнении испытуемых, которые демонстрируют низкие значения скорости переключения, но различаются по показателю скоординированности сенсорно-перцептивных и словесно-вербальных функций (показатель сформированности механизма непроизвольного интеллектуального контроля). Установлено, что функция непроизвольного контроля соотносится с регуляцией аффективные реакции ($p \leq .05$), что дает ощущение уверенности перед лицом неизвестности ($p \leq .05$). По-видимому, активизация функций непроизвольного интеллектуального контроля связана с общим состоянием когнитивных функций.

Выводы: 1) уровень селективного внимания и скорость переработки информации оказывают наибольшее влияние на процессы преодоления неопределенности в юношеском возрасте; 2) механизм непроизвольного интеллектуального контроля эксплицирует особый тип контролируемых реакций, которые имеют значение ресурсной составляющей личностного и интеллектуального потенциала субъекта для преодоления неопределенности.

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ПОНЯТИЕ «КЛЮЧЕВОСТИ» ДЛЯ СЛОВА В ТЕКСТЕ: СОЕДИНЕНИЕ КОГНИТИВНОГО, КОММУНИКАТИВНОГО И ИНФОРМАЦИОННОГО ПОДХОДОВ

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В чем проявляется природа ключевых слов (КС)? Что такое «ключевость» (keyness) в контексте каждого из трех подходов? В докладе делается обобщение – содержательного и методического характера – результатов наших экспериментов с носителями языка и вычислительных экспериментов. КС и природа его важности («ключевости») исследовалась для научных и художественных текстов (Пивоварова, Ягунова 2011; Ягунова 2011; Ягунова 2010).

Выделение и описание единичных КС не может быть достаточно для описания структуры текста и процедур его понимания; всегда речь идет о выделении наборов ключевых слов (НКС), описывающих текст. В наборах каждому КС приписываются веса, как правило, КС упорядочены по степени «ключевости». Такой НКС представляет свертку текста. В зависимости от целей работы, материала, расстановки информационных, коммуникативных и когнитивных акцентов меняются единицы анализа и контекст, в котором эти единицы реализуются. Единицей анализа могут служить (единица анализа указывается всегда в единстве с контекстом анализа)¹:

- КС в контексте текста (например, когда мы оцениваем КС через распределение в тексте);
- текст – или НКС как свертка текста – в контексте коллекции (где коллекция представляет собой собрание текстов некоторой степени однородности, например, одного автора, одной предметной области и т.д.).

1. Эксперимент с группой информантов, в результате которого исследователь получает НКС (Мурзин, Штерн 1991 и др.). Эти наборы во многом зависят от того, какая использовалась методика, какая группа информантов участвовала в этом эксперименте (Ягунова 2011). Вес

КС определяется числом информантов, выделивших его. Сопоставление с информационным подходом позволяет выявить формальные (и не совсем формальные) критерии, которые могли использоваться информантами.

Структура художественного текста характеризуется наибольшей неоднозначностью и вариативностью, иерархия КС допускает значительную вариативность, ее сложнее формализовать. В научном тексте степень однозначности гораздо выше, «правильность» иерархии КС во многом определяется базой знаний адресата (ей может быть сопоставлена текстовая база), она может быть существенно формализуема.

Мы использовали традиционную инструкцию А.С. Штерна: «Прочитайте текст. Подумайте над его содержанием. Выпишите из текста 10–15 слов, наиболее важных для его содержания» с небольшими вариантами. Во всех вариантах НКС представляли свертку текста как результат понимания текста. Существенное влияние на результаты оказывает специфика формирования групп информантов: учет базы знаний адресатов, особенно их текстовой базы, «включающейся» в ходе участия в эксперименте.

2. Методики выделения КС, используемые в информационных технологиях. Наиболее традиционный способ взвешивания слов – использование статистической меры TF-IDF, оценивающей степень важности («ключевости») слова в документе (тексте, подколлекции) по отношению к заданной коллекции (Salton, Buckley 1988). Таким образом, заданная контрастная коллекция выступает в качестве имитации текстовой базы адресата. Набор выделенных таким образом КС (упорядоченный по убыванию веса) может представлять свертку текста². Такая свертка может служить полномочным представителем текста (подколлекции), но основное ее предназначение – не просто описать текст (или результат понимания), но выделить его в контексте других текстов, собранных в

¹ Происходит все большее расширение термина «текст» (или в традиции технологического подхода «документ»): в зависимости от задачи под текстом понимается как единичный текст (напр., «Мертвые души» Н. В. Гоголя), так и однородная коллекция (напр., цикл «Петербургские повести» Н. В. Гоголя).

² Ср. Инфопортреты на webground.su, где КС выделяются на основе гораздо сложной метрики, но с использованием того же базового принципа.

контрастивной коллекции. НКС, выделенные в ходе эксперимента с информантами (НКС1) и в ходе вычислительного эксперимента (НКС2), совпадут, когда этому будут способствовать структуры текста и коллекции. Максимальное совпадение НКС1 и НКС2 возможно тогда, когда НКС1, т.е. свертка как результат восприятия и понимания текста, позволяет выделить этот текст в контексте коллекции (задача НКС2). И наоборот, минимальное совпадение вероятно, если НКС2 (свертка как сложный идентификатор, выделяющий текст) позволяет выделить текст, но КС из этого набора не являясь смысловыми вехами (не соответствуют задачам НКС1). Пример такого различия¹: НКС1: *язык, фонема, фонотактика, поиск, иностранный, звук, транскрипция, программа, словарь, комбинация, анализ, оболочка, звуковой, система, текст, статистический, сочетаемость, поисковая, электронный, сочетание, перекодировка, модель, изучение, слово, проблема*; НКС2: *звук, фонема, комбинация, согласный, взрывной, задний, преграда, сонант, транскрипционный, передний, позиция, редукция, помочь, сочетание, британский, гласная, иноязычный, иностранный, безусловно, английский, альвеолярный, альвеолярный, палатальный, англичанин, апи-кальный, аффриката, боковой, велярный*.

3. Краткие выводы. Признаки, влияющие на степень сходства между НКС1 и НКС2, представлены в формате «признак, увеличивающий сходство/признак, уменьшающий сходство НКС»: 1) тематическая центральность/

¹ Результат тематической периферийности текста (для коллекции по корпусной лингвистике): НКС2 содержит большое количество фонетических терминов, которые обладают высокой различительной силой для текста в данной коллекции, но не могут быть причислены к основным смысловым вехам текста (ср. с НКС1).

периферийность текста в коллекции (или текстовой базе информанта); 2) научный (новостной) /художественный функциональный стиль; 3) статичность/динамичность текста²; 4) объем текста (большой/малый); 5) четкость/нечеткость композиционной структуры.

Сопоставление роли «КС в контексте текста» и «текст в контексте коллекции» позволяет получить представление, что такое «ключевость» в контексте понимания, коммуникации и информационных технологий. Рассмотрение дополнительных формальных признаков: распределение КС в пространстве текста (неравномерное/ равномерное, тяготение к началу и/или концу текста, степень локализованности)³ может сблизить возможности вычислительного эксперимента и эксперимента с информантами.

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Salton G., Buckley C. 1988 Term-weighting approaches in automatic text retrieval. Information Processing and Management.— № 24 (5) — P. 513–523.

² Степень динамичности отражает количество и скорость сменяющих друг друга ситуаций, идеально статичный текст описывает одну ситуацию.

³ Сервис Д.В. Ландэ доступен по адресу <http://ling.infostream.ua/jag/>

КВАЗИСИНОНИМИЧНЫЕ ПРЕДЛОЖНЫЕ КОНСТРУКЦИИ КАК ОТРАЖЕНИЕ КОНЦЕПТУАЛИЗАЦИИ МИРА: СЕМАНТИКА И ОНТОГЕНЕЗ

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1. Постановка задачи.

Данный доклад посвящен исследованию семантических различий в пределах трех групп

предложных конструкций русского языка: 1) конструкций с глаголами речемыслительного действия (*говорить о* Упредл. / *говорить про* Увин.); 2) конструкций с глаголами «горестного чувства» (*скучать о* Упредл. / *скучать по* Удат.); 3) конструкций с глаголами контактно-направленного действия (*бить в* Увин. / *бить по* Удат.). С точки зрения языкового материала, исследование базируется на данных

НКРЯ, а в отношении усвоения рассматриваемых конструкций – на лонгитюдных записях речи русского ребенка, проводимых на протяжении более пяти лет. При сопоставлении двух конструкций в каждой из групп принято говорить об их синонимичности, между тем данные НКРЯ указывают на то, что их взаимозамена возможна далеко не всегда. Наше исследование показывает, что различия между конструкциями в каждой группе связаны с теми ограничениями, которые конструкция в целом накладывает на семантику своих компонентов. Предлагаемый подход к исследованию семантических различий между квазисинонимичными конструкциями, соединяющий теорию Московской семантической школы с Грамматикой конструкций Ч. Филлмора, позволяет выявить некоторые особенности концептуализации мира в русском языке.

2. Ограничения на состав конструкций.

2.1. Семантика конструкций с глаголами речемыслительного действия.

Семантические различия в пределах предложных конструкций с глаголами речемыслительного действия обусловлены тем, что предлоги *о* и *про* вводят разные семантические роли: предлог *о* вводит роль темы сообщения, в то время как предлог *про* вводит сразу две роли – роль темы сообщения и дополнительную роль содержания сообщения. Хорошей иллюстрацией здесь может служить характерная для детской речи фраза: *Я все про тебя (*о тебе) маме расскажу*. Здесь имеется в виду не какая-либо информация о человеке вообще, в частности, имя, дата рождения (тема), а какой-то определенный, скорее всего негативный факт, связанный с этим человеком, информацией о котором и владеет говорящий (содержание). Вообще, в речи ребенка первой появляется и значительно чаще употребляется именно *про*-конструкция, поскольку в детской речи чаще, чем во взрослой, появляется необходимость в некоторой дополнительной информации. Обратимся теперь к вопросу о природе субъекта в составе рассматриваемых конструкций с глаголами речемыслительного действия. Заполнение дополнительной валентности содержания подразумевает агентивный субъект (способный произвольно внести некую дополнительную информацию об обсуждаемом объекте), в то время как реализация роли темы сообщения не накладывает столь жестких ограничений на тип субъекта. И если на уровне поверхностного синтаксиса благодаря разнице в предлогах и предложном управлении отчетливо выделяются две конструкции на базе глагола *говорить* (с *о* и с *про*), то с позиции семантики

мы имеем в общей сложности четыре разновидности *о* / *про*-конструкций:

- 1) $\left\{ \begin{array}{l} \text{гф подлежащее} \\ \text{тета-роль агенс} \\ \text{кат. ИГ} \\ \text{пад. Им.} \end{array} \right\}, \left\{ \begin{array}{l} \text{гф косв. доп.} \\ \text{тета-роль тема} \\ \text{кат. ИГ} \\ \text{пад. Предл.} \end{array} \right\}$
- 2) $\left\{ \begin{array}{l} \text{гф подлежащее} \\ \text{тета-роль агенс} \\ \text{кат. ИГ} \\ \text{пад. Им.} \end{array} \right\}, \left\{ \begin{array}{l} \text{гф косв. доп.} \\ \text{тета-роль тема+содерж.} \\ \text{кат. ИГ} \\ \text{пад. Вин.} \end{array} \right\}$

(1) *Маша говорила о книге.*

(2) *Маша говорила про книгу.*

- 3) $\left\{ \begin{array}{l} \text{гф подлежащее} \\ \text{тета-роль инструмент} \\ \text{кат. ИГ} \\ \text{пад. Им.} \end{array} \right\}, \left\{ \begin{array}{l} \text{гф косв. доп.} \\ \text{тета-роль тема} \\ \text{кат. ИГ} \\ \text{пад. Предл.} \end{array} \right\}$

- 4) $\left\{ \begin{array}{l} \text{гф подлежащее} \\ \text{тета-роль стимул} \\ \text{кат. ИГ} \\ \text{пад. Им.} \end{array} \right\}, \left\{ \begin{array}{l} \text{гф косв. доп.} \\ \text{тета-роль тема} \\ \text{кат. ИГ} \\ \text{пад. Предл.} \end{array} \right\}$

(3) *Письмо говорило о встрече.*

(4) *Отпечатки пальцев говорят о его участии.*

2.2. Семантика конструкций с глаголами «горестного чувства».

Схемы конструкций с глаголами «горестного чувства» имеют следующий вид:

- 5) $\left\{ \begin{array}{l} \text{гф подлежащее} \\ \text{тета-роль экспер.} \\ \text{кат. ИГ} \\ \text{пад. Им.} \end{array} \right\}, \left\{ \begin{array}{l} \text{гф косв. доп.} \\ \text{тета-роль стимул} \\ \text{кат. ИГ} \\ \text{пад. Дат.} \end{array} \right\}$
- 6) $\left\{ \begin{array}{l} \text{гф подлежащее} \\ \text{тета-роль агенс} \\ \text{кат. ИГ} \\ \text{пад. Им.} \end{array} \right\}, \left\{ \begin{array}{l} \text{гф косв. доп.} \\ \text{тета-роль тема} \\ \text{кат. ИГ} \\ \text{пад. Предл.} \end{array} \right\}$

(5) *Скучаю по тебе.*

(6) *Он сожалеет о случившемся.*

Причиной семантических различий между этими двумя конструкциями также являются вводимые предлогами ролевые отношения. Предлог *о* вводит роль темы сообщения, поэтому этот предлог является типичным для глаголов речемыслительного действия, подлежащее при этом является агенсом; что касается предлога *по*, то он вводит роль стимула и подлежащее при этом является экспериенцером. Конструкция с

предлогом *о*, который вводит роль темы, подразумевает большую произвольность, контролируруемость действия, чем конструкция с предлогом *по*, который вводит роль стимула. Способность глагола встраиваться в ту или иную конструкцию связана со степенью произвольности выражаемого им действия, что отчетливо видно при анализе частотных глаголов. Лонгитюдные исследования данных конструкций говорят о том, если в процессе усвоения конструкций с глаголами речемыслительного действия когнитивно значимым оказывается наличие некоторой дополнительной, не связанной непосредственно с объектом, информации (что характерно для *про*-конструкции), то при усвоении конструкций с глаголами «горестного чувства» когнитивно значимой оказывается произвольность, контролируемость, меньшая абстрактность действия.

2.3. Семантика конструкций с глаголами контактно-направленного действия.

Говоря об ограничениях, которые конструкции с глаголами контактно-направленного действия накладывают на семантику существительного, заполняющего вторую валентность, отметим, что предлоги *в* и *по* также вводят разные роли. Предлог *в* вводит роль цели, и Увин. концептуализируется как некая плоскость, закрывающая полость, которая и является своего рода «местом назначения». Предлог *по* вводит роль пациенса, и Удат. ассоциируется с некоторой поверхностью, которая претерпевает некое

действие. Именно поэтому *в дверь стучат*, чтобы впустили; а *по двери стучат*, чтобы произвести некий шум. Таким образом, рассматриваемые нами конструкции имеют следующий вид:

- $$\begin{aligned}
 7) & \left\{ \begin{array}{l} \text{гф подлежащее} \\ \text{тета-роль агенс} \\ \text{кат. ИГ} \\ \text{пад. Им.} \end{array} \right\} \left\{ \begin{array}{l} \text{гф косв. доп.} \\ \text{тета-роль цель} \\ \text{кат. ИГ} \\ \text{пад. Вин.} \end{array} \right\} \\
 8) & \left\{ \begin{array}{l} \text{гф подлежащее} \\ \text{тета-роль агенс} \\ \text{кат. ИГ} \\ \text{пад. Им.} \end{array} \right\} \left\{ \begin{array}{l} \text{гф косв. доп.} \\ \text{тета-роль пациенс} \\ \text{кат. ИГ} \\ \text{пад. Дат.} \end{array} \right\}
 \end{aligned}$$

Для детей раннего возраста именно идея контакта с поверхностью с целью извлечения громкого звука оказывается когнитивно более значимой, чем идея абстрактного проникновения вовнутрь.

3. Вывод.

Рассматриваемые квазисинонимичные предположные конструкции функционируют и усваиваются как особые единицы языка, которые обладают своей семантикой, определяющей их синтаксическую структуру и семантические ограничения на заполнение мест.

Данное исследование осуществляется при поддержке РГНФ (проект 11-34-00302a2) и РФФИ (проект 12-06-90700-моб_ст).

ЧТО ТАКОЕ «ЖИВЫЕ КОГНИТИВНЫЕ СИСТЕМЫ»?

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Исследования и разработки, ориентированные на имитацию динамических процессов управления в живых системах, проводятся уже несколько десятилетий (Анохин, 1968, 1978, Винер, 1983, «Virtual Human», 1998, Величковский, 2006, Xiao-Jing Wang, 2010, Яхно, 2006, Самсонович, 2011, Полевая, 2008, Яхно и др., 2010). Основной инструментарий в таких разработках представлен базовыми схемами, компьютерными и математическими моделями с биолого-правдоподобной архитектурой, набором основных динамических режимов базовых моделей (с верификацией их соответствия данным экспериментов) и версиями устройств, симулирующих поведение живых систем в

заданных областях применения. При создании такого инструментария особо следует отметить важную роль выбора адекватной архитектуры используемых моделей, т.е. обязательный учет в модельной схеме таких взаимодействий между элементами системы, которые позволяют воспроизвести функциональные возможности, присущие живым системам. Из множества функциональных механизмов, реально действующих и обеспечивающих все необходимое разнообразие в поведении живых систем, выделим следующие:

1. механизмы, варианты архитектуры обработки большого потока сенсорных данных, обеспечивающие возможность быстрого реагирования на фрагменты тех сенсорных данных, которые уже известны системе по ее прошлому опыту;

2. механизмы, особенности архитектуры преобразования и сопоставления внешних и

внутренних сенсорных данных, позволяющие настроить, обучить систему на любой новый сенсорный сигнал, чтобы уметь эффективно распознавать его в дальнейшем;

3. механизмы внутренней иерархии сенсорных данных, позволяющие оптимизировать представление системы о внешнем мире и эффективно его использовать в дальнейшем функционировании.

В докладе показано, что модельные модули, представленные наборами однородных нейроноподобных систем, позволяют реализовать режимы параллельного кодирования сенсорных сигналов (механизмы быстрой обработки). Это – модули 1-го уровня (Яхно, 2006, Яхно и др., 2010). К модулям 2-го уровня относятся элементарные «адаптивные распознающие системы» с возможностью реализации процессов осознания входного сигнала (Яхно, 2006, Яхно и др., 2010). Выделен интегральный феноменологический параметр, который позволяет определять виды режимов работы модуля («бессознательный», «осознанный» или «кома»-подобный). Такая классификация следует из особенностей функциональных режимов обработки входного сенсорного сигнала. Для каждого распознаваемого класса объектов может быть введена такая интегральная зависимость. Уровень «мотивации», определяющий принимаемое решение, зависит от величины ошибки соответствия, вычисляемой между поступившим на вход сенсорным сигналом и тем имитационным образом, который система ожидала (опережающее отражение действительности). Важную роль в таких модулях играет специальная подсистема «Данные о прошлых и ожидаемых режимах модуля», в которой хранится индексное описание прошлых состояний модуля (с учетом мотивационной значимости событий) (Яхно, 2011). Работа этой подсистемы позволяет, в частности, описывать особенности оценок времени между запомненными событиями в прошлом. Важную роль при симуляционном описании работы живых систем выполняет специальный модельный модуль, который определяет динамику уровней «стрессового напряжения» в системе, в зависимости от величин сигналов рассогласования (ошибок) между реальным входным и ожидаемым сигналами (Парин, 2011, Парин и др., 2007). Этот вариант модуля 2-го уровня, реагирующий как на информационные сигналы, так и в случае физических повреждений в системе, позволяет более эффективно использовать прошлый опыт распознающих модулей для процедур дополнительного обучения и принятия решений в текущих внешних условиях. Для точной

интерпретации регистрируемых экспериментальных данных о реакциях человека следует использовать иерархические модели (модули 3-го уровня), описывающие осознанное восприятие как интегративный процесс. Приведен набор базовых архитектур моделей нейроноподобных систем, позволяющий сформировать непротиворечивое описание данных психофизических экспериментов. Модели выбраны таким образом, чтобы их параметры могли быть определены из данных психофизических и нейрофизиологических экспериментов.

Сопоставление архитектуры и возможных динамических режимов работы модулей 2-го и 3-го уровней с известными данными о поведении живых систем позволяет постулировать утверждение: **определяющий признак живой системы заключается в возможности внутренней интерпретации распознающей системой входного сигнала и использовании этой интерпретации для оптимизации текущего решения на основе прошлого опыта.** При этом оптимизация текущего решения реализуется в тех динамических процессах, которые аналогичны осознанному, бессознательному или интуитивному принятию решений, оценкам времени в «эпизодической памяти», внутренней динамике выбора целевых функций, использованию когнитивных фильтров и других, свойственных живому, процессов.

Обсуждаемый в докладе набор функциональных моделей-модулей позволяет вводить определения и адекватно описывать многие экспериментальные данные, связанные с динамикой поведения нейроноподобных систем и этапами когнитивных процессов, реализуемых в них. Например, определить и описать различные режимы осознанного и бессознательного восприятия сигналов, рассмотреть варианты механизмов восприятия времени, режимов «когнитивной слепоты» и ряда других жизненных реакций.

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ИНФОРМАТИВНОСТЬ ДИНАМИЧЕСКИХ ПРОЦЕССОВ САМООРГАНИЗАЦИИ ВЫСЫХАЮЩИХ КАПЕЛЬ В ОЦЕНКЕ КАЧЕСТВА ЖИДКИХ СРЕД

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Возможность идентификации какого-либо объекта определяется информативностью и адекватностью параметров, выбранных для его описания. Проблема идентификации многокомпонентных жидкостей актуальна для широкого круга задач – от медицинской диагностики и криминалистики до оценки качества пищевых продуктов и лекарств. Современные методы решения этой проблемы основаны на анализе исследуемых жидкостей с помощью оптической спектроскопии, жидкостной, тонкослойной или газовой хроматографии, капиллярного электрофореза, а также мультисенсорного анализа (Ганшин и соавт., 1999). Процедура принятия решений может включать в себя сравнение массивов полученных данных с данными эталона с использованием нелинейного метода главных компонент (Gorban et al., 2007), позволяющего снизить размерность пространства измерений за счет выделения наиболее информативных элементов. Такой подход, несомненно, позволяет оценивать качество жидкостей (Xie 2005, Chen et al., 2009, Tanaka et al., 2011), однако необходимость дорогостоящего оборудования и сложность обработки данных делают его малоприменимым для широкого использования.

Альтернативный путь получения исчерпывающей информации о качестве жидкостей может быть реализован на основе естественных процессов самоорганизации, происходящих в их высыхающих каплях (Lin, 2011). При этом в качестве информативного параметра можно использовать динамику интегральных механических свойств капли, как физического объекта, в процессе ее высыхания (Yakhno et al., 2007, Яхно и соавт., 2009). Регистрация этой динамики с помощью акустической импедансометрии позволяет получать «динамические портреты» многокомпонентных жидкостей и осуществлять их количественный сопоставительный анализ с соответствующими эталонами. Процесс «сжатия информации» реализуется естественным путем за счет интегрального вклада всех компонентов жидкости в динамику механических свойств капли. Это значительно упрощает параметризацию полученных данных, что делает метод экспрессным. Метод дешев, прост в использовании и информативен. Приводятся примеры использования данного подхода в медицинской диагностике, оценке качества пищевых продуктов и лекарств.

Сопоставление информативности динамики механических свойств высыхающей капли с данными экспериментов о восприятии запахов в живых системах позволили выдвинуть гипотезу об универсальности такого механизма при формировании и обработке сенсорных сигналов в живых системах (Зевеке и соавт., 2003; Яхно и Яхно, 2009). В свете этой гипотезы предлагаемая

методика исследования высыхающей капли может использоваться как техническое сенсорное устройство, симулирующее свойства естественных рецепторных систем (Санина и соавт., 2011).

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Симпозиум «Когнитивное развитие дошкольников и проблемы подготовки детей к школе» / Symposium “Cognitive development of preschoolers and the preparation of children for school” (in Russian)

Ведущая: Марьяна Михайловна Безруких
Chair: Mariana M. Bezrukih

КОМПЛЕКСНАЯ ДИАГНОСТИКА РАЗВИТИЯ ДОШКОЛЬНИКОВ И ВЫДЕЛЕНИЕ ФАКТОРОВ РИСКОВ ШКОЛЬНОЙ ДЕЗАДАПТАЦИИ

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Проблема ранней диагностики факторов риска в развитии, способных вызвать дезадаптацию при начале систематического обучения, а следовательно, и школьные трудности, является одной из наиболее актуальных задач современного образования. Диагностика факторов риска за год до начала систематического обучения позволяет выстроить адекватную систему предшкольного образования, разработав индивидуальные адаптивные программы развития. Методика, разработанная в Институте возрастной физиологии РАО (Безруких М. М. и др. 2006:

124), содержит все необходимые материалы для комплексной диагностики развития ребенка и включает в себя оценку социально-личностного, эмоционального, творческого, физического, моторного и познавательного развития (внимания, памяти, речи, зрительно-пространственного восприятия, зрительно-моторных координаций, мышления, организации деятельности).

В ходе исследования, проведенного в течение 5 лет в 17 регионах России, были обследованы около 25 000 дошкольников 6–7, 5 лет. Известно, что рост и развитие детей протекают неравномерно и зависят как от генетических, так и от средовых факторов. Разница между биологическим и паспортным возрастом может составлять от полутора до двух лет, причем биологический возраст чаще всего отстает от паспортного. Физическое и моторное развитие является

важнейшим показателем развития и состояния здоровья. Для оценки биологического возраста использовали оценку достижения определенных пропорций тела и начало смены молочных зубов. Известно, что количество постоянных зубов в 6 лет – от 1 до 5, в 6,5 лет – от 2 до 8, и в 7 лет – от 6 до 10 (Нижегородцева Н. В. 2010: 256). Отрицательный филиппинский тест и отсутствие смены молочных зубов свидетельствовали об отставании биологического возраста от календарного. Моторное развитие включало оценку статического равновесия и двигательную пробу. В результате обследования выявлены около **30%** детей, имеющих низкий уровень **физического и моторного развития**, что, несомненно, может не только осложнить процесс адаптации к систематическим учебным нагрузкам в школе, но и стать причиной ухудшения состояния здоровья.

Личностное развитие – это результат взаимодействия ребенка и окружающих взрослых на этапах дошкольного развития. Дефицит общения современных детей со сверстниками и чужими взрослыми затрудняет формирование адекватной самооценки, формирование статуса ученика. Согласно полученным данным,

высокий и средний уровень сформированности личностного развития наблюдается у **80–85%** дошкольников.

Углубленное изучение **эмоционального развития** выявило очень тревожные факты – более половины современных дошкольников (от 52 до 59%) имеют несформированность эмоциональной сферы, т.е. сложности в процессе определения, дифференциации эмоций других людей, а также выражения собственных эмоций. Недостаточный уровень сформированности эмоционального развития влечет за собой трудности в обучении, приводит к неадекватным реакциям ребенка на ситуацию обучения и снижение его познавательных способностей. В результате такие дети могут демонстрировать негативное отношение к процессу обучения, острые, не соответствующие по силе и интенсивности реакции на критику и оценки, неожиданные и неадекватные поведенческие ответы.

Предполагается анализ влияния занятий по программам индивидуального адаптивного развития в группах кратковременного пребывания на функциональное развитие дошкольников и снижение риска школьной дезадаптации.

ПОЗНАВАТЕЛЬНОЕ РАЗВИТИЕ ДЕТЕЙ СТАРШЕГО ДОШКОЛЬНОГО ВОЗРАСТА. ПОПУЛЯЦИОННОЕ ИССЛЕДОВАНИЕ

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Диагностика познавательного развития детей старшего дошкольного возраста необходима для определения готовности ребенка к систематическому обучению. Объективная оценка функционального развития будущего первоклассника с каждым годом становится все более актуальной, т.к. часто вместо этого определяют запас сведений, знаний и уровень освоения программ, по которым проводятся занятия в дошкольных образовательных учреждениях (Комплексная диагностика уровней освоения «Программы воспитания и обучения в детском саду». 2012: 73; Афонькина Ю. А. 2012: 66). Доказано, что причинами школьных трудностей являются несформированность или недостаточный уровень развития таких познавательных функций, как организация деятельности, зрительно-пространственное и

слухоречевое восприятие, внимание, память и мышление, мелкая моторика и др. Особое значение для успешного обучения в начальной школе имеет способность к произвольной регуляции. Степень сформированности этих функций является одним из важнейших факторов, определяющих готовность ребенка к обучению. В период от 5 до 7 лет функциональные системы мозга, обеспечивающие произвольные формы психической деятельности, проходят стадию качественных преобразований и индивидуальный разброс в темпах их созревания у разных детей достаточно высок (Развитие мозга и формирование познавательной деятельности ребенка. 2009: 432; Физиология развития человека. 2010: 768.) Паспортный возраст ребенка на этом этапе развития может не совпадать с биологическим и отличаться на полтора года.

Комплексная методика диагностики функционального развития детей старшего дошкольного возраста была разработана в Институте возрастной физиологии в 2006 году (Безруких М. М. и др. 2006: 124) и апробирована в 14 регионах России. Популяционное

исследование, охватывающее 25 000 детей 6–7,5 лет, проводимое в течение 5 лет в 17 регионах России, включая Архангельскую и Калининградскую области, Республику Карелия, Москву, Московскую и Калужскую области, Пермский край и Республику Татарстан, Ставропольский край и Ростовскую область, Свердловскую и Тюменскую области, Забайкальский край, Иркутскую, Новосибирскую и Томскую области, а также Приморский край, даст возможность составить «портрет» познавательного развития современного первоклассника.

В результате проведенного исследования можно констатировать, что только от 12 до 20% (разных регионов РФ) дошкольников имеют высокий уровень сформированности таких познавательных функций, как внимание, зрительно-пространственное восприятие, память, зрительно-моторные координации, речь и произвольная регуляция деятельности. Дети, имеющие высокий уровень риска дезадаптации, при несформированности 2 и более показателей развития (таких, как развитие речи, зрительно-пространственного восприятия, мелкой моторики и зрительно-моторных координаций, внимания, памяти, организации деятельности) относятся к группе «высокого риска» и составляют от 5 до 7%.

Большинство будущих первоклассников 72–75% имеет средний уровень сформированности вышеперечисленных функций. От 27 до 35% детей характеризуются трудностями **организации деятельности**, выражающимися в непонимании инструкции, неумении работать по плану, вносить коррекцию по ходу выполнения работы, проверить выполненную работу, найти и исправить ошибки.

Несформированность **речи** отмечается у 25–32% дошкольников и проявляется в неправильном и нечетком звукопроизношении, несформированности грамматического строя речи, бедном словарном запасе и неумении составить развернутый рассказ по последовательным картинкам. Около 5–7% детей не могут определить логическую последовательность событий по серии предлагаемых картинок, что свидетельствует о проблемах установления причинно-следственных связей.

Трудности **зрительно-пространственного восприятия** наблюдаются у 23–37% детей, что согласуется с данными ИВФ РАО (Безруких М. М., Терехова Н. Н. 2008: 13–26). Эти сложности могут спровоцировать в будущем сложности в обучении навыкам письма и чтения.

Развитие **мелкой моторики и зрительно-моторных координаций** отражает зрелость нервно-мышечной регуляции и произвольной регуляции деятельности и является основной базой для формирования навыков письма и других двигательных действий (Кольцова М. М. 2006:169; Feder К.Р. 2007). Количество детей, имеющих низкий уровень развития мелкой моторики и зрительно-моторных координаций, составляет от 39 до 44%.

Развитие **внимания и памяти** – необходимый компонент эффективного обучения. 20% обследованных детей имеют низкий уровень развития этих функций, что может стать причиной комплексных школьных трудностей. Однако низкий уровень развития внимания и памяти может быть связан не только с индивидуальными особенностями развития этих функций, но и с нарушениями физического и психического здоровья, с высоким эмоциональным напряжением.

Мышление, отражающее запас сведений ребенка о себе, о мире, событиях, явлениях, умение классифицировать, устанавливать причинно-следственные связи, проводить аналогии, как правило, достаточно развито у современных детей. Однако по результатам проведенной диагностики можно отметить, что часть детей (12%) имеют низкий уровень развития логического мышления, затрудняются с установлением логической последовательности событий и явлений (причинно-следственных связей), классификацией предметов и явлений.

Низкий уровень развития **вербально-логического и наглядно-образного мышления**, низкий уровень концентрации внимания могут стать причиной комплексных трудностей при обучении письму, чтению, математике, что подтверждается исследованиями успешности освоения базовых навыков чтения и письма у первоклассников (Безруких М. М. 2009: 464).

Выявлено влияние социально-культурных условий жизни на познавательное развитие детей. Предполагается анализ взаимосвязи показателей когнитивного развития между собой и их связи с биологическим возрастом и функциональным развитием мозга.

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ОСОБЕННОСТИ МОЗГОВОЙ ОРГАНИЗАЦИИ КОГНИТИВНОЙ ДЕЯТЕЛЬНОСТИ У ДЕТЕЙ ПРЕДШКОЛЬНОГО ВОЗРАСТА

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В период от 5 до 7 лет в когнитивной деятельности ребенка происходят важнейшие изменения, обусловленные как социальными, так и биологическими факторами. Среди социальных факторов наиболее значимым является начало систематического обучения, которое сопровождается сменой характера познавательной деятельности и социального взаимодействия, причем и то, и другое предъявляет повышенные требования как к процессам обработки значимой информации, так и к процессам произвольной регуляции. Среди биологических факторов ведущими являются прогрессивные морфофункциональные изменения лобных отделов коры и их связей с другими корковыми и глубинными структурами мозга.

Для выявления ключевых преобразований в познавательной деятельности ребенка на этом этапе онтогенеза и лежащих в основе этих преобразований нейрофизиологических механизмов были проведены комплексные нейropsychологические, поведенческие и электрофизиологические сравнительные исследования детей 5–6, 6–7 и 7–8 лет.

Полное нейропсихологическое обследование по методике А. Р. Лурия, адаптированной Т. В. Ахутиной, показало, что у детей без трудностей обучения и отклонений в поведении при переходе от 5–6 к 6–7 годам основные значимые изменения касаются произвольной регуляции действий (преимущественно усвоения инструкций и алгоритмов) и эффективности процессов зрительно-пространственного синтеза. Для исследования нейрофизиологических механизмов этих особенностей когнитивной деятельности был проведен анализ связанных с событием потенциалов мозга (ССП), а также поведенческих

параметров (времени реакции и успешности) у детей 5–6 и 7–8 лет при решении когнитивных задач, связанных с интеграцией зрительной информации в единый целостный образ. Использовались задачи двух типов: (1) задача на идентификацию фрагментированных неполных изображений знакомых предметов и (2) задача на распознавание глобальных vs. локальных признаков зрительных иерархических стимулов (большие буквы, составленные из маленьких букв) по предварительной инструкции.

Исследование поведенческих показателей идентификации неполных изображений выявило значимо более низкую эффективность этого процесса в 5–6 лет по сравнению с 7–8 годами. При анализе связанных с событием потенциалов (ССП) было установлено, что у детей 5–6 лет в процесс опознания в меньшей степени вовлекается префронтальная лобная кора. Кроме того, было обнаружено, что в этом возрасте отсутствует специализированное участие в процессе опознания фрагментированных изображений нижневисочных областей коры, которые на более поздних этапах онтогенеза играют ключевую роль в интеграции сенсорных признаков и формировании целостного образа.

Относительная незрелость в 5–6 лет механизмов, определяющих интеграцию зрительной информации в единый образ, была выявлена и при распознавании иерархических стимулов. На основании анализа поведенческих параметров было обнаружено, что в этом возрасте на фоне более низких показателей эффективности распознавания как локального, так и глобального уровней стимула отсутствует свойственный взрослым и детям 7–8 лет эффект предпочтения целого, а у части детей этого возраста отмечается предпочтение деталей. Анализ SSP выявил у детей 5–6 лет более высокую реактивность корковых зон при распознавании деталей, чем при распознавании целого. Значимые возрастные различия были связаны с процессами селекции, как на ранних

этапах сенсорного анализа (компонент N1), так и на этапе выделения значимых признаков (компонент N2). В обоих случаях у детей 5–6 лет величина негативных компонентов была выше при локальном распознавании, чем при глобальном. У детей 7–8 лет и взрослых амплитуда компонента N1 была значимо выше при распознавании целого, чем при распознавании деталей, а связанные с уровнем распознавания различия компонента N2 зависели от локализации отведения. Компонент P2, который ассоциируется с процессами сенсорной категоризации, у детей 5–6 лет также был выше при распознавании локального аспекта стимула, чем при распознавании глобального аспекта, при этом значимые различия отмечались в теменных зонах коры. У взрослых испытуемых подобные изменения компонента N2 были обнаружены в лобных зонах коры.

Результаты комплексных исследований указывают на относительную незрелость мозговых механизмов целостного восприятия зрительных объектов у детей 5–6 лет по сравнению с детьми старшего возраста. Подобная незрелость в свою очередь может быть связана с недостаточным развитием мозговых систем нисходящего контроля и недостаточной специализацией ассоциативных корковых зон в процессах обработки зрительной информации. Поскольку формирование навыков письма и чтения в значительной степени базируется на синтезе зрительной информации и программировании действий, форсирование процессов обучения письму и чтению в дошкольном возрасте, на фоне относительной незрелости этих компонентов когнитивной деятельности, может негативно влиять на процесс адаптации ребенка к обучению в школе.

АДАПТАЦИЯ К СИСТЕМАТИЧЕСКОМУ ОБУЧЕНИЮ И ЭФФЕКТИВНОСТЬ ФОРМИРОВАНИЯ ЗРИТЕЛЬНОГО ВОСПРИЯТИЯ

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К факторам, лимитирующим темп созревания организма ребенка, многие исследователи относят стресс, обусловленный началом систематического обучения ребенка и трудности адаптации к школе (Кирпичев В. И., 1996 и др.). Граница между первым детством (дошкольный период) и вторым – возраст 6–7 лет – является одним из узловых, переломных моментов онтогенеза, когда происходят глубокие многообразные изменения в протекании физиологических и психофизиологических процессов. То, что именно на этом этапе ребенок попадает в новые социальные условия, испытывает продолжительное и интенсивное умственное, физическое, эмоциональное напряжение, связанное с учебой, создает предпосылки для перегрузок и развития психосоматических нарушений.

Исследованиями большого числа физиологов, психологов, медиков, педагогов показано, что систематическое школьное обучение оказывает на организм учащихся глубокое и многостороннее влияние (Бахарева Е. А., 2005). Наиболее ярко оно проявляется в младшем школьном возрасте, особенно в начальный период адаптации к условиям обучения (Безруких М. М., 1991).

Дети приспосабливаются к новым видам деятельности с разной степенью успешности. Признаки стресса, общего адаптационного синдрома по Г. Селье, отмечаются у всех детей в начальный период обучения (Адаптация организма..., 1982). В этом убеждают и результаты многочисленных исследований, фиксирующих в младшем школьном возрасте заметное повышение распространенности невротических реакций и соматических расстройств по сравнению с дошкольным возрастом. Закономерно изменяются и поведенческие, психологические характеристики ребенка (Илюхина и др., 2002). Все это отрицательно сказывается на возможности усвоения учебного материала, осложняет и без того напряженное психофизиологическое состояние ребенка (Бахарева Е. А., 2005).

С началом систематического обучения резко увеличивается нагрузка и на зрительный анализатор, что неблагоприятно сказывается на функциональном состоянии и развитии функций зрения, снижается острота зрения (Базарный В. Ф., 1988, Коновалов А. В., 2001). Такая тенденция отмечена во всем мире. На начальном этапе школьного обучения у детей в условиях Севера снижен показатель эргономической устойчивости зрительного анализатора (0,71 отн. ед. против 0,84 отн. ед. у детей средних широт) (Базарный В. Ф., 1981).

Для проверки предположения о влиянии начала систематического обучения на темп

Компоненты зрительного восприятия		Разница между возрастным нормативом и показателем теста (доли года)		Уровень значимости различий (Mann-Whitney / ANOVA*, p)
		Дошкольник (n=170)	Первоклассник (n=182)	
Зрительно-моторная интеграция		0,57±0,03	0,57±0,02	< 0,924*
Помехоустойчивость		-0,07±0,02	0,33±0,02	< 0,0000
Константность		0,39±0,03	0,62±0,02	< 0,0000*
Зрительно-пространственное восприятие	4 субтест	-0,17±0,02	0,32±0,02	< 0,0000
	5 субтест	0,27±0,03	0,42±0,02	< 0,0000
Зрительный анализ-синтез		0,77±0,04	0,44±0,02	< 0,0000*
ЗВ (средняя разница)		0,29±0,02	0,45±0,01	< 0,0000*

Таблица 1. Уровень развития компонентов ЗВ у детей 7 лет, посещающих различные образовательные учреждения

формирования зрительного восприятия нами была сделана выборка детей 7 лет, посещающих разные образовательные учреждения: ДОУ и общеобразовательные школы. Зрелость зрительного восприятия определялась по методике оценки уровня развития зрительного восприятия Безруких М.М., Морозовой Л.В. (1996). Математический и статистический анализ практических результатов исследования, проводился с применением пакета прикладных программ Microsoft Excel, SPSS 11,5 для Windows.

Дисперсионный анализ показал, что существуют достоверные различия в темпах формирования большинства компонентов зрительного восприятия у детей с разным образовательным статусом (табл. 1).

Нами не выявлено различий в успешности формирования зрительно-моторных интеграций.

Следует отметить более высокие темпы формирования зрительного анализа-синтеза у первоклассников по сравнению с дошкольниками. Вероятно, накопление аналитического опыта в процессе обучения позволяет детям этой категории более успешно решать сложные аналитические зрительные задачи.

По остальным компонентам зрительного восприятия у первоклассников 7 лет достоверно худшие показатели уровня развития, чем у дошкольников 7 лет. Все это позволяет говорить, что затраты организма на адаптацию к школе

у первоклассников таковы, что не оставляют резервов для совершенствования зрительного восприятия.

Адаптация организма учащихся к учебной и физической нагрузке: под ред. А.Г. Хрипковой, М.В. Антроповой. М.: Педагогика, 1982. 240 с.

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МЕЖДИСЦИПЛИНАРНЫЙ НЕЙРОПСИХОЛОГИЧЕСКИЙ И НЕЙРОФИЗИОЛОГИЧЕСКИЙ АНАЛИЗ РИСКОВ УЧЕБНОЙ ДЕЗАДАПТАЦИИ У ДЕТЕЙ 6–7 ЛЕТ

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От развития познавательной деятельности в старшем дошкольном возрасте зависит последующая адаптация ребенка к школьному обучению. Ребенок, испытывающий сложности в усвоении знаний или демонстрирующий отклонения в поведении уже в дошкольном образовательном учреждении, имеет риск развития школьной дезадаптации. Понимание мозговых механизмов, лежащих в основе познавательных дефицитов и отклонений в поведении детей старшего дошкольного возраста, является важным для раннего выявления и профилактики школьных трудностей.

С целью выявления когнитивных и нейрофизиологических факторов, определяющих риски школьной дезадаптации, проведено исследование особенностей познавательного развития и функционального состояния мозга у детей 6–7 лет с трудностями усвоения знаний (когнитивные трудности (КТ), $N=20$, средний возраст 6 лет, 5 мес.) и проблемами в регуляции поведения (поведенческие трудности (ПТ), $N=35$, средний возраст 6 лет, 5 мес) по сравнению с их сверстниками, подобных трудностей не испытывающими (контроль, $N=14$, средний возраст 6 лет, 4 мес). Все дети добровольно участвовали в исследовании при информированном согласии родителей. Исследование проведено в общеобразовательных дошкольных учреждениях Москвы. Группы сформированы на основании экспертных оценок воспитателей.

Нейропсихологическое обследование проводилось по классической схеме А. Р. Лурия, адаптированной для детей 6–9 лет Т. В. Ахутиной и соавторами [1], и модифицированной в целях настоящего исследования. Методика анализа регуляторных и информационных компонентов деятельности подробно представлена в [4; 5]. Для оценки функционального состояния и степени соответствия возрастной норме морфофункционального созревания коры и глубинных структур головного мозга использовался структурный анализ ЭЭГ [2]. Для статистического анализа межгрупповых различий интегральных показателей когнитивных дефицитов применялся непараметрический критерий Мана-Утни. При сравнении частоты представленности в

группах ЭЭГ паттернов, характеризующих функциональное состояние мозга, – критерий χ^2 .

Все дети с трудностями, независимо от характера этих трудностей, демонстрировали снижение возможностей усвоения инструкций и алгоритмов деятельности ($p=0.002$ для группы ПТ и $p=0.004$ для группы КТ), неустойчивость усвоенных алгоритмов ($p=0.011$ для группы ПТ и $p=0.008$ для группы КТ), а также низкую работоспособность ($p=0.001$ для группы ПТ и $p=0.028$ для группы КТ) по сравнению с детьми контрольной группы. Для детей с трудностями обоих типов было характерно снижение точности словоупотребления, более выраженное у детей с когнитивными трудностями ($p=0.012$).

Помимо перечисленных особенностей, дети с когнитивными трудностями отличались низким темпом выполнения заданий ($p=0.011$), обедненным словарным запасом ($p=0.028$), а также особенностями зрительно-пространственных функций в виде трудностей воспроизведения структурно-топологических ($p=0.060$) и координатных ($p=0.060$) отношений при копировании и воспроизведении по памяти зрительно-пространственного материала.

Дети с поведенческими трудностями отличались от детей контрольной группы по ряду компонентов произвольной регуляции деятельности, демонстрируя импульсивность ($p=0.057$), трудности затормаживания начавшегося действия ($p=0.001$), низкие возможности контроля ошибок ($p=0.092$). Кроме того, они отличались сниженным контролем своих эмоциональных реакций ($p=0.001$). При выполнении заданий они быстро утомлялись ($p<0.001$) и были неусидчивы ($p=0.001$). Интересно отметить, что, несмотря на то, что с точки зрения воспитателей, у этих детей не отмечалось проявлений когнитивных дефицитов, при нейропсихологическом обследовании они демонстрировали отклонения зрительно-пространственной деятельности в виде выраженной фрагментарности при копировании сложных изображений ($p=0.032$), что свидетельствует о сниженных возможностях целостного восприятия зрительной информации.

По данным ЭЭГ-исследования, в группах детей с трудностями учебной адаптации обоих типов часто встречались отклонения функционального состояния фронто-таламической системы (ФТС) от возрастной нормы. Значимые различия по сравнению с контрольной группой

выявлены у детей с когнитивными трудностями (в 65% случаев, $p=0.010$). Можно предположить, что неоптимальное состояние этой регуляторной системы является основным нейрофизиологическим фактором выявленных в настоящем исследовании дефицитов произвольной регуляции деятельности и дефицитов лексико-семантических компонентов речи. В наших предыдущих исследованиях [3; 5] было показано, что дети 7–8 лет с ЭЭГ-признаками дисфункции либо незрелости ФТС отличаются от детей контрольной группы более высокими показателями трудностей произвольной регуляции деятельности и нарушениями семантических аспектов речи.

В группе детей с поведенческими трудностями была отмечена значительная представленность локальных изменений ЭЭГ правого полушария (в 54,3% случаев, $p=0.007$), что, вероятно, является значимым нейрофизиологическим фактором выявленных в этой группе отклонений в регуляции поведения и особенностей зрительного восприятия. По данным наших предыдущих исследований [4], для детей с отклонениями функционального состояния структур правого полушария характерны быстрая утомляемость, дефицит произвольной регуляции деятельности, трудности регуляции эмоциональных проявлений, а также особенности анализа и обработки зрительно-пространственной информации, в том числе, трудности целостного восприятия. Обнаруженные у части детей этой группы трудности распознавания

эмоций и мотивов других, по-видимому, связаны с отклонениями функционального состояния структур лимбической системы (11,4% случаев, $p=0.092$), которые принимают специфическое участие в обеспечении анализа информации, необходимой для социального взаимодействия [6; 7].

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ФУНКЦИОНАЛЬНЫЕ ВОЗМОЖНОСТИ ОРГАНИЗМА ДОШКОЛЬНИКОВ ЕВРОПЕЙСКОГО СЕВЕРА РОССИИ И ГОТОВНОСТЬ К ШКОЛЬНОМУ ОБУЧЕНИЮ

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В жизни ребенка каждый год является чрезвычайно важным для физического, психического и интеллектуального развития. Особенно сложным для детского организма является первый год обучения в школе. Как пройдет этот год, насколько хорошо адаптируется ребенок к новым условиям, людям, режиму, к новой социальной роли, зависит от многих факторов. В этом отношении большое значение имеет уровень функциональных возможностей детей, начинающих систематическое обучение в школе.

Изучение воздействия экстремальных климатических и антропогенных факторов на рост, развитие и состояние здоровья показало, что у детей, проживающих в условиях Архангельской области, наблюдается ухудшение здоровья особенно среди детей дошкольного возраста и младшего школьного возраста [Макарова В. И., 2003]. Влияние на организм человека неблагоприятных специфических факторов Севера – длительный период «термальных стрессов», резкая асимметричность фотопериодизма (периоды «белых ночей», биологических сумерек и тьмы), частые и резкие колебания барометрического давления, повышенная электромагнитная активность – в большей степени отражается на развитии растущего организма [Александрова Г. А., 2006; Душкова Д. О., 2008; Макарова В. И.,

2003]. Кроме того, начало обучения в школе требует дополнительного напряжения гомеостатических и нейрофизиологических механизмов регуляции функционирования организма ребенка.

С целью выявления особенностей морфофункционального и психофизиологического развития детей старшего дошкольного возраста г. Архангельска обследованы 455 воспитанников ДООУ (223 мальчика и 232 девочки).

Оценка морфофункциональных показателей обследованных детей выявила: преобладание астено-торакального морфотипа, низкий уровень развития костно-мышечного аппарата, тенденцию напряжения механизмов физиологической адаптации [Лукина С.Ф. и соавт., 2006]. Так, среди старших дошкольников у 60,7% выявлен астено-торакальный тип, характеризующийся преобладанием продольных размеров над поперечными и значительным напряжением физиологических функций [Изаков С.И. и соавт., 2005]. В исследованиях О.А. Гуровой и М.Л. Лазарева (2002) отмечается, что у детей 6–8 лет г. Москвы жизненная емкость легких (ЖЕЛ) составляет $1,8 + 0,25$ л [Гуровой О.А., Лазарева М.Л., 2002]. У обследованных дошкольников-северян этот показатель значительно ниже и составляет у мальчиков $1335,07 \pm 218,66$ мл, у девочек $1227,93 \pm 206,97$ мл. В ходе исследования установлено, что в состоянии покоя у мальчиков гемоглобин крови насыщен кислородом на $95,12 \pm 1,92\%$, у девочек – на $94,71 \pm 3,07\%$, что ниже возрастных нормативов [Гуминский А.А., 1995.]. Выявлены корреляционные связи между степенью сатурации гемоглобина и величиной жизненной емкости легких ($r = 0,346$, при $p > 0,05$). Низкий уровень ЖЕЛ и оксигенации крови приводит к развитию тканевой гипоксемии, отрицательно сказывающейся на физическом развитии ребенка, ухудшению умственной работоспособности, повышению раздражительности, появлению спонтанной гиперактивности.

Начало систематического обучения в школе требует определенного уровня развития механизмов, обеспечивающих тонкокоординированные движения ведущей руки при письме. Известно, что созревание нейродинамических структур мозга, принимающих участие в подготовке к выполнению движения и выборе моторной программы, происходит только к 9–10 годам, а в возрасте 6–8 лет структуры мозга, контролирующие моторику мелких мышц пальцев руки, еще не созрели. Количество детей с возрастным несоответствием уровня развития моторных координаций по группе обследованных составляет 55,6%. Зрелость моторных координаций зависит

не только от сформированности механизма нервной регуляции, но и от состояния костно-мышечного аппарата, информативным показателем которого является сила мышц кистей рук. Нами установлено, что сила мышц кисти ведущей руки составила у мальчиков $8,85 \pm 2,34$ кг, у девочек $8,03 \pm 2,06$ кг. Данные значения ниже нормативных, установленных Доскиным В.А. с соавторами (2000), что свидетельствует об отставании в развитии костно-мышечной системы детей-северян по сравнению со сверстниками из средних регионов России [Доскиным В.А. с соавт., 2000]. У преобладающего большинства обследованных детей (92,3% девочек и 84,4% мальчиков) выявлен низкий и ниже среднего уровень динамометрии мышц ведущей руки.

Анализ результатов обследования психофизиологических, школьно-значимых функций выявил неравномерность их развития у старших дошкольников. Некоторые из них у большинства обследованных имеют низкий или ниже среднего уровень развития, что может затруднить освоение школьных умений и навыков, оказать негативное влияние на состояние здоровья в процессе адаптации к школе: уровень развития зрительного восприятия не соответствует возрасту у 45% детей, более 50% – характеризуются низким уровнем развития зрительной и 35% – слуховой памяти, несоответствие возрастным характеристикам развития внимания отмечено более чем у 20%, а дефицит развития наглядно-образного мышления обнаружен у 77% дошкольников. Оценка темповой организации деятельности выявила, что большинство обследованных имеют крайние типы работоспособности: более 50% детей относятся к медлительным, а более 30% – имеют проявления гиперактивности.

Таким образом, результаты мониторинговых исследований выявили некоторые особенности психофизиологического и морфофункционального развития детей-северян 6–7 лет, подчеркнув специфику развития детского организма в сложных климато-географических и экологических условиях Европейского Севера России. Наши исследования подтверждают необходимость проведения в ДООУ ряда оздоровительно-укрепляющих мероприятий. Учет функциональных возможностей ребенка позволит организовать учебно-воспитательный процесс, обеспечивающий адекватные условия для успешной подготовки детей к систематическому обучению в школе.

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ДОЛГОСРОЧНЫЕ ПРЕДИКТОРЫ УСПЕШНОСТИ КОГНИТИВНОГО РАЗВИТИЯ: ЛОНГИТУДНОЕ ИССЛЕДОВАНИЕ БЛИЗНЕЦОВ В МЛАДЕНЧЕСКОМ И ДОШКОЛЬНОМ ВОЗРАСТЕ

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Результаты подавляющего большинства экспериментальных работ указывают на отсутствие межвозрастной стабильности в уровне интеллекта между младенческим и последующими возрастами и на наличие такой стабильности с 2–3 лет жизни (Bornstein, 1997). В то же время в литературе широко представлены данные о том, что время разглядывания нового стимула и скорость привыкания к новому стимулу можно рассматривать как предикторы уровня интеллектуального развития в более старших возрастах (Sigman et al., 1991; McCall & Carriger, 1993; Rose, Feldman, 1995). Изначально эти параметры рассматривались как маркеры скорости обработки информации, однако в той же мере они могут отражать способность к организации внимания к внешнему миру (Colombo, 1991). Поведенческие реакции ребенка в любом возрасте определяются одновременно влиянием нескольких факторов, что делает принципиально невозможным выбор однозначной интерпретации получаемых данных (Colombo, Cheatham, 2006). С этой точки зрения представляется обоснованным и перспективным привлечение нейрофизиологических характеристик, отражающих работу различных нейросистем внимания.

На сегодняшний день в младенческой ЭЭГ, зарегистрированной в состоянии привлеченного внимания, выявлены маркеры двух независимых

нейросистем: системы выбора мишени внимания и выбора канала внимания (Stroganova & Orekhova, 2007). Цель первой из них – повысить интенсивность обработки определенного стимула – «мишени», защитив ее от интерференции со стороны других, менее значимых в данный момент стимулов (Vinogradova et al., 1998). Цель второй – обеспечить поддержание внимания к определенному сенсорному каналу (Suffczynski et al., 2001) за счет торможения обработки информации, поступающей по «нерелевантным» сенсорным каналам. Мы решили экспериментально проверить гипотезу о том, что индивидуальные различия в работе каждого из ранних механизмов внимания в младенческом возрасте могут влиять на динамику развития внимания и интеллекта ребенка вплоть до старшего дошкольного возраста.

Методика.

Выборку составили 100 детей из 26 МЗ и 24 ДЗ однополых пар г. Москвы. Все дети были рождены не ранее 32 недель, вес при рождении не менее 1900 гр, в анамнезе и на момент обследования отсутствовали неврологические проблемы, психомоторное развитие соответствовало возрасту. В 8–11 месяцев регистрировали ЭЭГ в двух ситуациях: зрительное внимание к мыльным пузырям и зрительный покой – пребывание в темной комнате (контрольное состояние). Данные подвергли спектральному анализу; в среднем анализировали 40с безартефактной записи ЭЭГ в каждой из ситуаций. Полученные усредненные спектры абсолютных амплитуд частотных бинов с шагом 0,4 Гц объединяли в диапазоны тета (Гц) и альфа (Гц) активности (статья про границы).

В 5–6 лет детям была проведена оценка интеллекта с помощью теста К-АВК (Kaufman, Kaufman, 1983), родители заполняли опросник

Младенческий возраст (8–11 месяцев)	Дошкольный возраст (5–6 лет)							
диапазон состояние	Трудности внимания (опросник)		Целостная обработка информации		Последовательная обработка информации		Суммарный показатель (IQ)	
	ЗВ	ЗП	ЗВ	ЗП	ЗВ	ЗП	ЗВ	ЗП
СА тета ритма	18,8 **	19 **	21,6***	11*	8,7*	—	13,6**	—
СА альфа ритма	15,7*	—	—	25***	—	—	—	11,7*

*Таблица 1. Результаты регрессии психологических характеристик в возрасте 5–6 лет к амплитудным характеристикам младенческой ЭЭГ (8–11 мес), зарегистрированной в различных функциональных состояниях. Примечания к таблице: приведены проценты объясняемой регрессионным уравнением межиндивидуальной дисперсии психологических характеристик и уровень значимости уравнения. ЗВ – состояние зрительного внимания; ЗП- состояние зрительного покоя (пребывание в темноте). * $p < 0,03$; ** $p < 0,003$; *** $p < 0,00003$*

о наличии трудностей регуляции внимания, основанных на симптомах синдрома дефицита внимания по версии DSM–IV (APA, 1994). Для оценки взаимосвязи параметров ЭЭГ с оценками по шкалам теста (3 шкалы) и опроснику было проведено 16 множественных регрессионных анализов, в каждом из которых СА тета или альфа диапазона 12 отведений младенческой ЭЭГ в одном из состояний выступали в качестве независимых переменных.

Результаты и обсуждение.

Сводная таблица результатов представлена в таблице 1.

Результаты анализа показывают, что эффективность работы системы выбора мишени внимания в конце первого года жизни оказалась надежным предиктором будущих трудностей регуляции внимания (ТРВ) и уровня когнитивного развития. ТРВ в дошкольном возрасте испытывают те дети, у которых в младенческом возрасте наблюдалась более слабая синхронизация тета активности в задних парасагитальных отведениях при привлеченном зрительном внимании. В то же время, для успешного интеллектуального развития важной характеристикой оказалась не степень синхронизации тета ритма, а выраженность градиента его синхронизации: ритм должен быть максимально выражен в центрально-париетальных областях коры мозга и в минимальной степени – в лобных областях. Эти данные аналогичны по структуре результатам анализа взаимосвязи между параметрами ЭЭГ

и психологическими характеристиками внутри одного возрастного диапазона (Строганова 2001, Пушина 2005, Новикова 2008), однако впервые получено доказательство одновременности влияния особенностей работы этой системы в раннем возрасте на последующее когнитивное развитие.

Эффективность работы системы выбора канала внимания оказалось значимой только с точки зрения проявления ТРВ: они оказались характерными для детей, у которых в младенческом возрасте наблюдалась более низкая степень синхронизации альфа ритма в париетальных отведениях – показатель, отражающий работу выбора центрального зрительного канала внимания (Stroganova, Orekhova 2007). В то же время, дальнейшее когнитивное развитие ребенка не зависит от ранних особенностей работы этой системы.

Неожиданный результат заключается в обнаружении существенной зависимости развития способностей к целостной обработке информации в дошкольном возрасте от степени синхронизации в младенческом возрасте альфа ритма в центрально-париетальных, но не затылочных областях коры в состоянии зрительного сенсорного покоя. Предположительно, этот факт свидетельствует о том, что дети с более высокими темпами созревания внутрикоровых связей в конце первого года жизни получают некоторое долгосрочное преимущество в когнитивном развитии вплоть до дошкольного возраста.

Alfred Yarbus Workshop on Active Vision, Cognition and Communication / Ярбусовский воркшоп «Активное зрение, познание и коммуникация»

Ведущие: Борис Митрофанович
Величковский, Йенс Хелмерт,
Себастиан Паннаш

Chairs: Boris Velichkovsky, Jens Helmert,
Sebastian Pannasch

IMPLICIT MEMORY REPRESENTATIONS IN THE OCULOMOTOR SYSTEM

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Humans tend to create and maintain internal visual representations of the environment that help guiding actions during the everyday activities. These representations range in their complexity from implicit memory to long-term memory. Recent studies have proposed that the oculomotor system might be critically involved in coding and maintenance of locations in memory. For example, saccade trajectories were found to curve away from a location kept in visual-spatial working memory. Furthermore, when participants were asked to memorize two locations, and then later select one location for further maintenance from that internal representation, saccades curved away from the ultimately remembered location. This

suggests that the oculomotor system is flexibly used for coding to-be-remembered locations that are no longer present in the outside world.

In the present study, we investigated whether *implicit* memory representations are also rooted in the oculomotor system. Implicit memory representations are created without awareness as a result of a selection episode. To test this idea participants had to perform a simple task of making a saccade towards a predefined direction. On two-thirds of the trials an irrelevant distractor was presented unpredictably left or right from the fixation. On one-third of the trials no distractor was present. The results show that on the trials without a distractor, saccades curved away from the location that was occupied by a distractor on the previous trial. In a follow-up experiment this result was replicated and extended to cases when different saccade directions were used. In addition, we show that repetition of distractor location on the distractor

present trials also results in a stronger curvature away. Taken together these results provide strong evidence that the oculomotor system automatically

and implicitly codes and maintains locations that had been selected in the past, which biases future behavior.

NEURAL CORRELATES OF CONE OF GAZE AND THE MONA LISA EFFECT: AN FMRI STUDY

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The eyes have always fascinated people and have metaphorically been said to be mirror of or the window to the soul. Indeed, observed gaze direction can reveal and signal the individual's actual locus of attention, intentions and internal states. Further, gaze can provide crucial information that is socially relevant for communication and interaction. Specifically, mutual gaze is an important, significant, and powerful cue for implicit social communication, which affects or even determines the immediate interpersonal interaction (e.g., Kleinke, 1986). Gaze understanding plays an essential role for social cognition and theory of mind (e.g., Baron-Cohen, 1995). Moreover, perceived eye contact can capture visuospatial attention (e.g., Senju & Hasegawa, 2005), and perceived averted gaze can trigger an automatic (reflexive) and rapid shift in the focus of observer's visual attention (e.g., Friesen und Kingstone, 1998). Remarkably, the capability to distinguish between mutual gaze and averted gaze emerges early in ontogenesis (e.g., Farroni, Csibra, Simion, & Johnson, 2002) as well in phylogenesis (e.g., Emery, 2000). In this context it is not surprising, that humans can estimate the gaze direction of others relatively accurately, especially if the gaze is directed towards themselves (e.g., Gibson & Pick, 1963).

More recently, Gamer and Hecht (2007) proposed to describe the subjectively perceived gaze direction not in the terms of a gaze ray, but with the metaphor of a *cone of gaze*. The cone of gaze is referred to as the range of gaze directions within which a person feels looked at. The width of the gaze cone was experimentally determined to amount to a visual angle of about nine degrees.

Interestingly, the gaze direction of merely depicted persons is perceived equally well and robustly, even if the social context is absent and the pictures have a lot of particularities. More precisely,

the eyes of a flat two-dimensional portrait appear to “follow” the observer as he or she moves around and changes the vantage point. This so called *Mona Lisa effect* is remarkably robust (Boyarskaya & Hecht, 2009; 2010) and breaks down only in the face of extremely oblique vantage points (Boyarskaya, Hecht, & Kitaoka, 2011).

Neuroimaging methods in humans have shown that superior temporal sulcus (STS), fusiform gyrus (FG), amygdala, intraparietal sulcus (IPS), MT/V5, medial prefrontal cortex (MPFC) and some other cerebral regions are engaged in gaze processing (for review see e.g., Itier & Batty, 2009). However, many findings are open to controversy, and we are far from being able to predict the locus of pictorial gaze perception.

We subjected Mona Lisa stimuli with different degrees of direct or averted gaze to an fMRI study to address the following questions: 1) What are the neural activation patterns for eye contact, clearly averted gaze, and intermediate gaze directions? 2) What are the neural correlates of the cone of gaze? We predict all gaze directions within the cone (± 5 degrees) to produce identical neural responses; for gaze direction beyond 5 degrees, however, neural response should be different. 3) What are the neural correlates of the Mona Lisa effect? We predict the effect to be fully reflected cortically, that is central and lateral picture positions should not differ.

We located the brain areas involved in eye contact processing and processing of averted gaze, as well as the particularities of processing of the gaze at the edge of the cone. In contrast to previous studies regarding gaze processing, we used irrelevant task demands, which obligated participants to focus on the portrait's eyes without performing an explicit gaze discrimination task. Thus, we assessed gaze perception implicitly. Further, we investigated whether and how the cortical activation patterns might differ depending on whether the portrait was viewed centrally or from an oblique vantage point. This is the first study which reports findings concerning the neural correlates of the cone of gaze and the Mona Lisa effect.

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EYE-TRACKING: A SENSITIVE TOOL FOR IMPROVING ROAD SAFETY

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In our information and technology based society, in tasks where cognitive skills are more important than physical ones, changes in operator attentional states could have significant impacts on performance, possibly causing delays in information processing or even cause the operator to ignore or misinterpret incoming information, with the reduction of the minimal acceptable levels of safety (see Di Stasi et al., 2010).

In the automotive field, the presence of an enormous variety of vehicle types and specifications, as well as the large variety of drivers' experience and personal characteristics/attitudes, make the study of the Driver-Vehicle-Environment system intrinsically difficult (Cacciabue & Carsten, 2010). Consequently, in the last five decades, applied psychologists and cognitive scientists have put a lot of effort into improving road safety. The need to monitor the driver in real-time has become a priority in order to determine the most appropriate type and level of automated assistance for helping drivers to complete tasks safely. The ability to measure mental state correctly and to continually estimate the level of attention of the driver is essential to measuring performance in safety-critical context, improving the usability of the human-machine interaction, and

designing appropriate and adaptive strategies for automation (Wickens, 2008). Therefore, it is crucial to be able to measure the driver's mental state to ensure road safety.

At the moment, there is no sensitive, valid and non invasive on-line measure to evaluate the level of attention/vigilance while the driver is sitting in his/her vehicle. The development of a method for monitoring in real-time the fluctuation of road user attention during driving could be a good starting point for undertaking the investigation of this crucial issue. Brain activity measurements provide an opportunity for a more direct and sensitive assessment of alertness fluctuations than other psychophysiological measurements. Human retinas are outgrowths of the brain and are thus part of the central nervous system; therefore gaze parameters may be used as "windows on the mind" that reliably indicate attentional or mental states. As a result of this, intuitively, eye-movement measurements should also play a role in the future of human-machine-interaction, particularly in the field of road safety (see Di Stasi, 2010).

In this study we present data from an ongoing research project on the cognitive, emotional and neuropsychological basis of risk behaviour while driving. The main goal of the project is to build a model of risk behaviour so that if certain cognitive, behavioural and emotional variables are known, we will be able to predict decisions made in the face of uncertainty and risk. The final goal being the designing of programs for evaluating, preventing and controlling risk behaviour. The objective of the present studies was to measure the drivers mental state during hazard perception situations using static driving/riding simulations. The

influence of task complexity, mental fatigue, and emotional distracters on the eye movements (main-sequence and eye scanpath) was investigated. In all experiments we used a multidimensional methodology, including behavioural, subjective, and eye movement data. Eye movement parameters were measured using a video-based eye tracking system.

Overall, these results point out that eye movement based indices could be a useful tool in the development of valid on-line measurements of driver attentional state (Di Stasi et al., 2012). Furthermore, our results could be useful in developing driver's support systems that will be able to reduce driving mistakes caused by inattention and fatigue, as well as better organization of transportation sectors' work schedules and optimizing performance.

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GAZE-BASED SCENE SONIFICATION FOR ORIENTATION IN THE DARK

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We present an attentive user interface that is based on auditory display techniques for sensory substitution (e.g., Bach-y Rita, 1972; Humphrey, 1999; O'Regan & Noe, 2001; Renier & De Volder, 2005). More specifically, we gaze-contingently (e.g., Reder, 1973; McConkie & Rayner, 1975) substituted visual sensations with auditory ones and investigated how this affected human orientation and object recognition in unknown environments. Experiments took place in complete darkness so that no visual stimulation was available. Although participants could not see, we know from earlier studies that systematic eye movements are executed under such conditions (Andrews & Coppola, 1999; Foerster et al., 2011a, b). By conveying visual information auditorily (“sonifying”), we can test the hypothesis that selectively sonifying those parts of an environment that participants look at (but cannot see) leads to similar mental representations than those generated from stimuli perceived visually. If the hypothesis holds, we can conclude that sensory substitution mediated by a gaze-contingent attentive interface leads to “perceptual substitution”. Visual perception,

or parts thereof, can be replaced by auditory perception.

Methodologically, we on-line mapped visual information onto acoustic signals which were then presented auditorily to a participant in real time. Rather than sonifying information from the entire field of view, only those areas were taken into account that a participant visually attended to. Assuming that the participant's gaze indicates the focus of attention (Just & Carpenter, 1980), the analysis of eye movements allowed for identifying the location of such areas. An SR Research EyeLink II eye-tracking system was used for monitoring participants' eye movements.

We systematically varied experimental conditions between and within participants. Participants had to perform object localisation, shape recognition and size assessment tasks. Tasks had to be accomplished in simple, uncluttered environments, for example, finding an object in front of an “empty” background that could be uniformly sonified. We then increased the ecological validity of the study by introducing a more complex environment condition that also contained background elements. Experiments were either conducted in two- or three-dimensional environments. Two-dimensional stimulus displays were screen-based and well suited for investigating fundamental aspects of the substitution process. Three-dimensional experimental environments further increased the ecological validity. For the 3d condition, a Kinect-sensor based depth

tracker was built and integrated into the eye-tracking experimental environment. It provided depth information for objects that were fixated in real-world environments, allowing for the gaze-contingent generation of auditory feedback for objects in 3d space. The experimental variations were cross-validated by testing them against a substitution method that was not gaze-contingent. In this control condition, participants manually shifted their focus of attention via a computer mouse.

Findings show that participants could pretty accurately solve all localisation, shape recognition and size assessment tasks in 2d. About 83% of items were localised correctly, while in 14% of trials one item was completely missed. Participants took approximately 42 seconds for the localisation task. The comparison of gaze-contingent sensory substitution with the control did not result in significant differences in localisation correctness or task completion time. Background complexity did not show significant effects either. Shapes were recognised correctly in 75% of trials and participants took about 28 second to accomplish this task. Again, no significant differences could be established between conditions. Size was only varied in the 3d presentation condition. The analysis of data for the 3d condition is currently under way. Preliminary results indicate that size assessment is more than 80% correct while the location of objects can be similarly accurately assessed in 3d “real world” environments as in the 2d display screen condition.

The findings and methodological developments demonstrate the plausibility and feasibility of the approach and constitute essential preliminaries for further research. Findings are relevant to theoretical aspects of cognitive science as well as to designing future perceptual interfaces. The work provides some new insights into the integration of oculomotor and auditory information for generating substitution representations of the visual

environment that humans live and act in. This enables us to understand more about learning and adaptation to new means of sensory stimulation by substituting or enhancing an existing sense. Novel perceptual interfaces for mobility assistance in the dark or for the visually impaired could make use of this type of perceptual substitution.

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DEVELOPING A GAZE-CONTINGENT MEASURE OF THE USEFUL FIELD OF VIEW IN DYNAMIC SCENES

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Our daily interactions with our environment contain a wealth of visual information, but we are only able to attend to and process a small fraction of it at any given moment. For instance, as someone drives down a road, their visual field contains information from the road, other vehicles, pedestrians, traffic signals, etc. However, at a given moment, the driver's attention may be allocated to only a small portion of the visual field, for example a yellow traffic signal at an intersection, rather than a pedestrian in the crosswalk, producing a potentially deadly situation. The area within which attention can actively process visual information is called the useful field of view (UFOV). The size of the UFOV decreases under the cognitive demands of both primary tasks (e.g. driving in light traffic vs. heavy traffic) (Crundall, Underwood & Chapman, 1999; 2002), and secondary tasks (e.g., talking on a cell phone) (Atchley & Dressel, 2004). Research by Clay et al. (2005) showed that a smaller UFOV significantly predicted a greater probability of future traffic collisions, which underscores the importance of the UFOV in real-life situations.

Despite the important contributions of previous research on the UFOV, current measures of the UFOV have several important limitations. One limitation of standardized measures of the UFOV (e.g., Ball, Beard, Roenker, Miller, & Griggs, 1998), is difficulty in integrating them with simulators, since the complex UFOV test stimulus would visually mask information that would otherwise be presented by the simulator. However, other measures such as the peripheral detection task (PDT) (Crundall, Underwood, & Chapman, 2002) can be integrated with a simulator without such problems. The PDT generally requires participants to detect the onset of a light that appears at fixed locations in the display (usually on its perimeter). However, typical PDT measures of the UFOV are also limited in that they do not control for the retinal eccentricity of the peripheral stimuli, since viewers

are constantly moving their eyes to locations at various distances from the targets. In addition, PDT measures of the UFOV generally do not take into account the eccentricity-dependent variation in contrast sensitivity across the visual field, since the peripheral detection targets are constant. Thus, detectability of PDT targets will vary with eccentricity, which will then be confounded with any purely attentional effects of eccentricity. More specifically, with such a method, it is unclear whether changes in the detectability of the targets as a function of retinal eccentricity are due to changes in the UFOV (i.e., attentional breadth), or are the result of relatively fixed physiologically-based variations in contrast sensitivity across the visual field.

The goal of the current program of studies is to develop a new measure of the UFOV that resolves the above-mentioned limitations. This new UFOV measure is a type of peripheral detection task in which subjects must detect blur in the visual field as a secondary task, while performing a primary task. To create a detection task, the blur is only presented occasionally at random intervals for a single fixation. To control for the retinal eccentricity of the blur, it is presented gaze-contingently at predetermined retinal eccentricities, using an eyetracker. The stimuli consist of dual-resolution scene photographs in which there is high-resolution within a circular "window" and a constant level of blur outside of it, and the window is centered on the current fixation location using eyetracking. To control for eccentricity-dependent variations in contrast sensitivity, we conducted pilot tests to determine specific blur levels for each predetermined eccentricity (windows of 3°, 6°, and 9° radius) that produced a constant level of moderate detectability (85%) for each in a blur detection single task.

Experiment 1 at Kansas State University (N = 16), did not allow eye movements, and used eyetracking to ensure that participants were fixated at the center of the screen when images were presented. Stimuli were static photographs briefly flashed for 150 ms, with blur present on 50% of the trials. We used a dual-task design, with the primary task being the cognitively demanding N-back task, and the secondary task being blur detection. We used a within-subjects design in which blur detection at 3°, 6°, and 9° eccentricity was compared as a function of N-back loads of 0, 2, and 3-back. The results showed that cognitive load significantly reduced peripheral blur detection, ($F(2, 60) = 4.34$, $p = .022$) but cognitive load did not interact with

retinal eccentricity ($F(4, 60) < 1$). Specifically, blur detection did not selectively decrease at greater eccentricities for higher levels of cognitive load. Instead, as cognitive load increased, blur detection became equally worse at all eccentricities. These results are consistent with a general interference effect of cognitive load rather than tunnel vision (Crundall, Underwood, & Chapman 1999).

In Experiment 2, subjects will be allowed to freely view static photographs in which extrafoveal blur is occasionally presented gaze-contingently on every 9th, 10th, or 11th fixation. We will again use the N-back task to vary cognitive load. To encourage many eye movements within each scene, we will use a difficult picture memory test as the cover task, and present images for 20 seconds each. Further studies will be carried out at the Beckman Institute (at the University of Illinois) in which we will incorporate the gaze-contingent peripheral blur detection task

in a driving simulator while manipulating cognitive load by varying traffic density.

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FURTHER INSIGHTS INTO AMBIENT AND FOCAL MODES: EVIDENCE FROM THE PROCESSING OF AERIAL AND TERRESTRIAL VIEWS

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In humans, vision is the dominant sensory modality. During visual perception, information is sampled from the environment via *active vision* (Findlay, 1998). Saccades – fast ballistic movements – redirect the foveal region of the eyes from one fixation point to another. During saccades, the intake and processing of visual information is largely suppressed and therefore it is limited to the periods of fixations. This interplay of fixations and saccades is essential, as highest visual acuity is limited to the small foveal region. Eye movement behaviour in many everyday situations, such as reading text or inspecting images, can be described as an alternation between fixations and saccades.

Fixation durations vary a great deal from one fixation to the next. It has been suggested that the length of a fixation is determined by information processing and by eye movement pre-programming. Fixation durations typically range from roughly 100–500 ms, but can last up to 2–3 seconds in some cases. Similarly, the length of saccades generally varies from between less than 1 degree to up to 130 degrees of arc (Land, 2004).

Importantly, Velichkovsky and colleagues (2005) reported particular relationships in the variation of fixation durations and saccade amplitudes that were related to certain modes of visual processing. More precisely, they found fixations of shorter durations (below 180 ms) often associated with larger saccades; this combination was termed *ambient processing* which is assumed to serve the processing of spatial aspects. Moreover, the combination of longer fixations and short saccade amplitudes was termed the *focal processing mode*, which is assumed to be concerned with the analysis of object features. The time course of these two processing modes has been investigated under different conditions of free viewing, which has revealed a systematic relationship: during early phases of scene inspection, the ambient mode seems to dominate while with increased time there is a transition to more focal processing (Pannasch, Helmert, Roth, Herbold, & Walter, 2008). This relationship has been observed across different types of stimuli and various visual tasks. However, the corresponding analyses were relatively coarse in terms of only comparing gaze behavior in two 2-second sequences (early vs. late).

The present experiment analyzes the time course of viewing behavior in greater detail by showing natural scenes under different display conditions: Terrestrial and aerial views were presented either upright or inverted. The research question was whether we would obtain similar gaze patterns to

those previously reported when looking at upright terrestrial views. By contrasting the viewing behavior in this particular case with images of different perspectives (aerial vs. terrestrial) and orientations (upright vs. inverted), we expected to gain further insights about the interplay between ambient and focal proceeding modes. Particularly, we know from gist recognition studies that compared to upright terrestrial views, both inverted terrestrial scenes and upright (as well as inverted) aerial scenes are much harder to recognize within the time course of a single fixation, and thus appear to require more than a single fixation to reach a high level of gist recognition (Loschky, Ellis, Sears, Ringer, & Davis, 2010). Thus we predicted to observe differences very early after the image onset; fixation durations should be shortest for terrestrial upright views. Starting with this hypothesis we examined if the different viewing conditions would influence only the initial gaze behavior or throughout a longer sequence of scene inspection.

Thirty volunteers participated and inspected a total of 720 natural aerial and terrestrial views, shown either upright or inverted (180 images in each display condition). Scenes belonged to one of six different categories: airport, beach, city, forest, mountain, or residential. Each image was shown for 6500 ms, and after the presentation subjects had to indicate the category of the previously seen image.

Our results revealed three major findings. First, fixation durations and saccadic amplitudes differed according to the respective view and orientation conditions of the scenes. Fixations were longest for aerial views (both upright and inverted) and shortest for upright terrestrial views. Saccade amplitudes were larger for aerial than for terrestrial views, whether upright or inverted. Second, the general gaze patterns along the time course of scene inspection followed earlier observations, i.e. a transition from early ambient to late focal processing. However, a closer inspection of the proportion of ambient/focal processing revealed less focal activity for aerial views across the entire time course while it was highest for inverted terrestrial views. Finally,

we analyzed further parameters to obtain a better understanding of the ongoing processing. For example, consistent with our predictions based on gist recognition for aerial scenes, we found longer first saccade latencies (i.e., the remaining time of a fixation after the picture onset) for both types of aerial views. Also, the saccadic peak velocities were higher for aerial views. Furthermore, we determined the similarity of scanpaths for each image across participants. Comparing the similarity indices for the different conditions revealed highest similarity between participants viewing terrestrial upright views and lowest similarity between participants viewing aerial views (whether upright or inverted).

To summarize, our results reveal differences in the gaze patterns when inspecting aerial vs. terrestrial views. In case of the aerial views, we found in various gaze parameters that this form of scene view has a clear influence on the balance of ambient and focal processing. While the general time course of ambient to focal processing remains stable, the proportion of focal processing is reduced and a greater dominance of the ambient mode is observed.

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ON THE TIME COURSE OF LEXICAL INFLUENCES IN READING: EVIDENCE FROM EYE MOVEMENTS

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Although it is well-established that fixation times during reading are influenced by lexical variables such as word frequency (see White, 2008 for a review), contextual constraint or predictability (e.g., Ehrlich & Rayner, 1981), and lexical ambiguity (see Duffy, Kambe, & Rayner, 2001 for

a review), competing models of eye movements control in reading disagree about the time course of lexical influences. Specifically, one class of models assumes that fixation times are primarily driven by visual/oculomotor factors and that lexical variables can only impact a small subset of long fixations, whereas a competing class of models assumes that lexical variables can have a fast-acting influence on the majority of fixation times during reading (see Rayner, 1998, 2009 for reviews).

Given that theories of eye-movements control in reading make competing assumptions about the time course of lexical influences, the goal of the present work was to provide fine-grained time course information about three prominent lexical variables. Specifically, readers' eye movements were monitored in a series of experiments that manipulated word frequency (target words were either low or high in frequency), predictability (target words were read once in a high-predictability context and once in a low-predictability context), and lexical ambiguity (lexically ambiguous target words, such as *bank*, were read once in a context that instantiated the more frequent or *dominant* meaning, such as the "money" meaning of *bank*, and once in a context that instantiated the less frequent or *subordinate* meaning, such as the "river" meaning of *bank*). All three of these lexical variables affected the duration of the very first fixation on the target words (i.e., *first fixation duration*), such that first fixation times were longer for the low frequency words relative to the high frequency words, longer for the low-predictability condition relative to the high-predictability condition, and longer for the subordinate condition relative to the dominant condition.

To provide further time course information, we examined each lexical variable's impact on distributions of first fixation times using both ex-Gaussian fitting (Staub, White, Drieghe, Hollway, & Rayner, 2010) and a survival analysis technique (Reingold, Reichle, Glaholt, & Sheridan, accepted). The ex-Gaussian analyses revealed that all three variables produced a significant shift in the distributions, such that the low frequency distribution was shifted to the right of the high frequency distribution, the low-predictability distribution was shifted to the right of the high-predictability distribution, and the subordinate distribution was shifted to the right of the dominant distribution. In addition, there was a significant skew effect for the word frequency variable (but not for the other two variables), such that the low frequency distribution

exhibited greater positive skew (right skew) as compared to the high frequency distribution. This pattern of ex-Gaussian results replicates prior work concerning word frequency (Staub et al., 2010) and predictability (Staub, 2011). Most importantly, the finding that all three lexical variables caused a shift in the distributions indicates that both short and long fixations were impacted, which is consistent with an early-acting time course of lexical influences.

In addition to examining ex-Gaussian distributions, the present work employed a survival analysis technique (for details see Reingold et al., accepted) to provide precise estimates of the timing of the first discernible influence of each variable's influence on first fixation durations. This survival analysis technique revealed that all three lexical variables produced an equally rapid effect on fixation times that emerged as early as 145 ms from the start of fixation. Taken together, the ex-Gaussian and survival analysis results are consistent with eye movements models that assume that lexical influences are fast-acting, and are inconsistent with models that assume that lexical effects are limited to a small subset of long fixations.

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ALFRED YARBUS' LIFE AND LEGACY: KALININGRAD 2012

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Alfred Luk'yanovich Yarbus (1914–1986) is one of the founders of modern eye movement research. His book *Eye Movements and Vision*, published in Russian in 1965, translated into English and re-published by the Plenum Press in 1967 and 1971, has had a profound influence on recent approaches to the study of active vision and cognition. The impact has been so tremendously widespread across a range of disciplines that

the book now stands as the single most cited publication in the area.

In these introductory remarks to the 4th Alfred Yarbus Symposium, I wish to address three major lines of contemporary development:

1) Progress in methodology including new technical solutions as well as the recent symbiosis of eye-tracking and brain imaging;

2) The permanent extension and refinement of experimental tasks and research questions, in particular with respect to relationships between eye movements and modes of visual attention;

3) Current applications of eye-tracking and its perspectives as one of the most promising cognitive technologies in the years to come.



FIGURE 1. Alfred Yarbus in 1945, left. Right, extract from the dust cover of the first English edition of *Eye Movements and Vision*.

EYE TRACKING IN RADIOLOGY-VISUAL SEARCH IN A 3-DIMENSIONAL SPACE

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Six years before Alfred Yarbus' famous book "Eye movements and Vision" was published in English, Tuddenham and Calvert (1961) made the

first, even though rudimentary, steps towards eye tracking research in the study of medical image perception. Since those days eye tracking has consistently made its way into research on medical image perception and the study of cognitive processes during the interpretation of radiological images (e.g. Kundel, Nodine & Carmody, 1978, Kundel & Nodine, 2007). One of the major focuses is the comparison of differing strategies of visual

search of novices and experts. It was found that experts interpret scans better and more quickly than novices, perform fewer fixations and cover smaller but more relevant areas of the scans. Furthermore, experts often fixate lesions within less than a second, hinting to the employment of holistic processing (Kundel & Nodine, 2007).

However, major technical innovations of the past 15 years have fundamentally changed the process of image interpretation. Whereas the vast majority of the experiments deal with two dimensional stimuli such as X-ray images, an increasing trend to multi-slice images can be observed (Arenson, Andriole, Avrin & Gould, 2000). By scrolling through multi slice images like Computer Tomography (CT) or Magnetic Resonance Imaging (MRI) a volumetric body is visually covered. Thus, viewing multi-slices adds a third axis to eye movements; namely the scroll path through images. Despite the proliferation of multi slice images in diagnostic medicine over the past decades, little research has yet been devoted to the study of visual search and image perception in multi slices. For the design of effective training, it is, however, essential to know what characterizes the visual search patterns of good and experienced readers.

In an explorative pilot experiment, the eye movements and scrolling behavior of four experienced radiologists (nine to eleven years of experience) were studied when reading 15 cranial CT cases, each consisting of 26 to 29 slices. Of those 15 cases, five contained either hemorrhages or ischemia, adding to seven lesions in total. The aim of the experiment was to assess whether experts primarily use holistic detection, characterized by quick task completion, small times to first fixation, small numbers of fixation and straight scrolling through slices.

Participants 2 and 4, performed best with regard to the number of true positive and false negative diagnoses as they both identified six of the seven lesions. However, they were also the ones who differed most regarding their time to read a case, eye movements and scrolling behavior: Whereas participant 2 on average took about three minutes to read one case, participant 4 completed a case in less than one minute. During this time participant 2 on average went through the stack of slices more than five times, whereas participant 4 only did so twice. Similarly participant 2 compared neighboring slices about six times as often as participant 4 did and took roughly three times as long to hit a lesion than

participant 4. Concomitantly, participant 2 initially dwelled three times as long on lesions as participant 4 did. Although participant 1 and 3 did not perform as well as participant 2 and 4, they showed gaze and scrolling behavior similar to participant 4 though not as extreme.

The results hint to the existence of diverse strategies and suggest that eye movement and scrolling patterns are linked up: Participants performing efficient patterns of eye movements show efficient scrolling patterns, whereas extensive scrolling is linked to more elaborate patterns of eye movement. The strategy exhibited in particular by participant 4, but also by participants 1 and 3, is in line with what is described in the literature as expert behavior, characterized by a high degree of holistic processing. However, participant 2's strategy is not reflected in this concept and rather resembles a novice's search-to-find strategy. Due to the small sample size and the explorative nature of the experiment the results need to be interpreted with care. However, they indicate that although expert radiologists might on average read scans very efficiently, there are huge deviations in the individual strategies. Strategies, which are characterized by an extensive search, might be neglected when averaging data over experts. However, in the present experiment such behavior has led to good performance.

A second experiment with 12 radiologists has been conducted to validate these findings. The data are currently being analyzed. The results of the extended experiment will be presented and its implications for the concept of expertise in multi slice image perception will be discussed.

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ВЛИЯНИЕ ВЕЙВЛЕТНОЙ ФИЛЬТРАЦИИ ТЕКСТА НА ХАРАКТЕРИСТИКИ ДВИЖЕНИЙ ГЛАЗ В ПРОЦЕССЕ ЧТЕНИЯ

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Одним из наиболее ярких и удобных подходов для исследования когнитивных механизмов является чтение – продукт удачного взаимодействия в процессе эволюционного, биологического, социального и исторического развития. Во время чтения работа зрительной системы определяется с отношением деятельности различных зрительных каналов, в частности, магно и парво проводящих путей. Парво-система детализирует восприятие и тем самым играет важную роль в идентификации букв. Магно-система участвует в распределении внимания по странице [1]. В задачу эксперимента входило исследовать характеристики движений глаз в зависимости от метрологически выверенных оптических преобразований текста, а именно пространственно-частотной вейвлетной фильтрации, обеспечивающей большой диапазон изменений от повышения резкости до полного размытия текста и разрушения его структуры. Эта задача исследования позволяла достичь цели работы – выяснить роль разных каналов зрительной системы в обеспечении чтения.

Методическое обеспечение исследований

В исследовании принимали участие 25 наблюдателей. С помощью 17» ЭЛТ монитора с разрешением экрана 1280x1024 последовательно предъявлялось 6 слайдов с текстом черными буквами на сером фоне. В среднем слайд содержал 600 знаков, включая пробелы и знаки препинания. Тексты были предварительно подвергнуты вейвлетной фильтрации с помощью многомасштабного разложения изображения с использованием DoG – функций (DoG – сокращение от Difference of Gaussians) – вейвлетов, представляющих собой разность двух двумерных функций Гаусса с различной полушириной. Размер вейвлетных элементов зависел от выбранного уровня «пирамиды»: для уровня 1–8 пикселей, 2–16, 3–32, 4–64, 5–128, 6–256 пикселей, что соответствует 0.23; 0.46; 0.93; 1.86; 3.71; 7.42 угловым градусам.

Под размером вейвлета подразумевается расстояние в пикселах (угловых градусах) между двумя минимумами диаметрального сечения вейвлета. Перед наблюдателем стояла задача прочитать текст (или постараться прочитать

текст), после чего нажать на кнопку мыши. Расстояние от глаз испытуемого до монитора составляло 60 см. В процессе чтения с помощью iView XRed 250 (SMI, Германия) регистрировались движения глаз. Система iView X RED 50 имеет частоту дискретизации в 50 Гц для записи движения глаз. Исследовались следующие параметры: количество и длительность саккад и фиксаций, время прочтения, общий паттерн движений глаз, а также зависимость всех этих параметров от размера вейвлетного элемента.

Результаты и обсуждение

Чем больше время прочтения (меньше скорость чтения соответственно), тем большее количество фиксации совершают глаза наблюдателя. В среднем на один фрагмент текста читатель совершал 27 фиксаций. Средняя продолжительность фиксации составляла 0,31 секунды, что совпадает с данными А. Л. Ярбуса о том, что средняя продолжительность фиксации обычно лежит в пределах 0,2–0,4 секунды.

Зависимость времени прочтения от размера вейвлетного элемента.

Время прочтения с ростом вейвлетного элемента, начиная со второго уровня пирамиды, практически равномерно снижается. Это связано с постепенным разрушением структуры текста и его переходом в «узор» из вейвлетных элементов – наблюдатель прикладывает все большие усилия для того, чтобы опознать и прочесть фрагмент текста и затрачивает на это большее количество времени. Также нарушаются пропорции текста и изменяется пространство между знаками и строками, что в свою очередь тоже влияет на скорость чтения [2]. Количество фиксаций взора с ростом размера вейвлетного элемента также постепенно снижается, что объясняется все тем же разрушением структуры текста, при котором постепенно исчезают мелкие детали: знаки сначала становятся трудно различимыми и сливающимися друг с другом, а затем исчезают совсем.

Зависимость средней длительности фиксации взора от размера вейвлетного элемента.

Средняя длительность фиксаций постепенно увеличивается с увеличением размера вейвлета, но длительность саккад при этом практически не изменяется. Количество фиксаций (и соответственно саккад) в единицу времени при этом остается неизменным, что подтверждает концепцию об автоматии саккад, сформулированную Филиным В. А. в 1987 году, согласно которой саккады обусловлены деятельностью структур

мозга, способных к ритмогенезу без внешних побудительных причин, по типу пейсмекеров. Кроме того, паттерн движений глаз, характерный для чтения, постепенно разрушается по мере роста размера вейвлетного элемента. Этот факт достаточно просто объясняется тем, что с ростом вейвлетного элемента постепенно разрушается структура текста (искажается строка, размываются буквы и т.д.) и он превращается в своего рода «картину», а паттерны движений глаз при просмотре картин и чтении существенно различаются.

Зависимость средней длительности саккад от размера вейвлетного элемента.

В зависимости от задачи, поставленной перед наблюдателем, изменяются многие параметры. Наиболее выраженным является изменение числа саккад. Так, их число минимально при фиксации взором точки, больше при рассматривании картины и максимально при чтении. При чтении число саккад возрастает почти в два раза по сравнению с рассматриванием изображения, даже содержащего мелкие детали.

Известно, что если фиксировать взор в центре страницы, изображения представляются более четкими, чем на ее периферии, т.е. в данном случае на периферии поля зрения. Можно предположить, что разная степень размытия текстов в данном эксперименте соответствует тому, как представлено изображение на сетчатке при

удалении от центра поля зрения к периферии на разные расстояния.

Заключение.

Можно предположить, что постепенное размытие текстов вначале нарушает вклад парво, и лишь затем работы именно магно-системы при чтении. То есть при малом размытии текстов парво-система получает недостаточно информации для эффективной работы. При значительном размытии структура движений глаз нарушается, а определяет в этом случае стратегию движений глаз магно-система. Таким образом, парво-система при чтении контролирует длительность фиксации и длину саккад, и таким образом контролирует количество знаков текста, попадающих в поле зрения за одну фиксацию. Магно-система определяет стратегию движений глаз по странице при чтении, то есть распределение внимания по странице (экрану). Тем самым показан вклад и взаимодействие парво и магно каналов зрительной системы в процессе чтения.

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Workshop “Neurocognitive Mechanisms of Human Linguistic Behaviour” / Воркшоп «Нейрокогнитивные механизмы языкового поведения человека»

Ведущие: Андрей Мячиков,
Christoph Scheepers, Юрий Штыров
Chairs: Andrey Myachykov,
Christoph Scheepers, Yury Shtyrov

WORDS AS TOOLS: AN EXTENDED VIEW. KINEMATICS EVIDENCE

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Embodied cognition studies have demonstrated that words are grounded in perception, action, and emotional system, providing convincing and multifaceted evidence (for reviews, see Fischer & Zwaan, 2008; Toni et al., Jirak et al., 2010). Overall, these studies have privileged a referential view of language. For example, the Indexical Theory (Glenberg & Robertson, 2000) has shown that words index their referents, which are represented in terms of perceptual symbols (Barsalou, 1999). Even if they have underlined the relationship between action and words, they have somehow neglected the idea that words are instruments to perform actions, idea which has been proposed by philosophers adopting an extended mind perspective (e.g., Clark, 1998).

In the talk we will start from the idea that words can be conceived as tools (Words As Tools proposal: Borghi & Cimatti, 2009; under review). Specifically, we will report kinematics evidence in favor of two reasons why words can be considered similar to tools: a. similarly to tools, words allow us to catch objects, and this determines a modification of our bodily borders; b. similarly to tools, they allow us to perform actions and modify the current state of the world.

If this is the case, then words, similarly to tools (Iriki et al., 2004; Farne & Ladavas, 2005), should extend our bodily boundaries (Borghi & Cimatti, 2010). We will present two experiments (Scorolli, Nico, and Borghi, in preparation) that test this hypothesis. Participants were presented with objects located in the peripersonal, extrapersonal and “border” space (reachable extending the arm and the back). Before and after a training session they had to estimate the objects distances and to push a toy-car towards the objects’ location.

During the “tool-yes” and “word-yes” training they used a rake or the correct linguistic label to reach the far objects. In the “tool-no” and “word-no” conditions the tool and the word were not effective in accomplishing the task. In the second experiment we introduced a further tool – a button that allowed participants to reach the objects – and compared it with the rake and with the word. Results of both experiments demonstrate that body schema is plastically re-arranged not only by a physical external auxiliary but also by the social experience of language.

In a second study (Gianelli, Scorolli and Borghi, in press) we focused on a social situation. We investigated how the reach-to-grasp movement was influenced by the presence of a second person present in the laboratory. This person could be either a friend or a non-friend, was either invisible (behind)

or located in different positions with respect to an object and to the Agent, and pronounced a sentence using either a first or a second person pronoun (“I grasp”, “You grasp”). We found that both maximal fingers aperture and velocity peak was influenced by the kind of relationship and by the position with respect to the agent. Most crucially to our aim, the investigation of the overall reaching movement time showed an interaction between the Speaker and the Pronoun: participants reached the object more quickly when the Other spoke, particularly if she used the “I” pronoun. This suggests that speaking, and particularly using the “I” pronoun, evokes a potential action. Implications of the results for embodied cognition are discussed.

The results of the two studies are discussed in the framework of embodied and grounded theories of language and of extended views of cognition.

EMBODIED NUMERICAL COGNITION

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There is much recent interest in the idea that we represent our knowledge together with the sensory and motor features that were activated during its acquisition. While this “embodied cognition” stance seems almost intuitive for action-related knowledge such as verb meanings, the same claim appears far-fetched when it comes to numbers and arithmetic. Numerical cognition is a knowledge domain that has long been thought of as a paradigmatic example for abstract symbol manipulation. Yet, with the discovery of systematic associations between number magnitude and physical space (Dehaene et al., 1993) it became evident that embodiment signatures are still present also when adults think of numbers.

Building on a recent meta-analysis of the evidence for spatial-numerical associations by Wood et al. (2008), I will first document sensory and motor biases emerging from single digit processing. This serves as an introduction to the main part of the presentation which is to introduce a terminological clarification. Specifically, I propose to distinguish between grounded, embodied and situated cognition in order to derive testable predictions for embodied numerical cognition (for details, see Fischer & Brugger, 2011). Grounding is a universal constraint that associates magnitudes with vertical space such that “more is up”. Embodiment refers to individual-specific sensory-motor experiences,

while situated cognition refers to the flexible mapping of magnitudes onto horizontal space that is shaped by cultural constraints.

The last part of this presentation reports behavioural, neuroscientific, and learning studies that have examined the proposed hierarchical relationship between grounding, embodiment and situatedness of numerical cognition. Predictions about embodied numerical cognition that were supported by recent research include a stronger vertical than horizontal spatial mapping of numbers (Shaki & Fischer, 2012), the spontaneous motor cortical activation when passively viewing number symbols (Tschemtscher et al., 2012), and the extension of spatial association from single numbers to mental arithmetic (operational momentum effect; Pinhas & Fischer, 2008).

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THE NEURO-COMPLEXITY OF LANGUAGE: A FUNCTIONAL-EVOLUTIONARY PERSPECTIVE

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In this paper, a chapter out of a book (Givón 2009), I will survey the brain structures that support language processing, dealing primarily with those that underlie the evolutionary growth of complex syntactic structure (grammar). I will focus on two

aspects of grammar-relevant neurology that closely recapitulates well-known evolutionary trends: (a) the adaptation of pre-existing structures that performed non-linguistic functions to amenable, later-evolved language-processing functions. And (b) the distributive network character of structures that perform more recently-evolved (thus more complex) functions.

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PHONOLOGICAL, SEMANTIC, AND MORPHOLOGICAL ASPECTS OF SECOND LANGUAGE AUDITORY LEXICAL ACCESS

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Lexical access in late (adult) second language (L2) learners is poorly understood beyond the fact that the L2 mental lexicon is smaller in size than that of native speakers (NSs) since L2 learners do not know many words. This study explores the mechanisms underlying nonnative lexical access at the phonological, semantic, and morphological levels, employing a primed auditory lexical decision task. In this task, participants heard two Russian words in each trial, the prime and then the target, with a 320 ms interval between them. They responded to each pair by indicating via a button press whether the second word was a real word or a nonword, with half of the targets being nonwords. The properties of the prime and the target were manipulated, and reaction times (RTs) were compared between targets preceded by related or unrelated primes, to establish whether priming effects (facilitation or inhibition) were present.

Results from three types of primes are reported: phonological, semantic, and morphological. The same participants took part in all three experiments – a group of adult Russian NSs (N=11), and three groups of adult American learners of Russian with varying proficiency levels. L2 proficiency was established using a standardized oral proficiency test, and participants were rated on the Interagency

Language Roundtable (ILR) scale as 2 (Advanced, N=21), 2+ (Advanced High, N=18), or 3 (Superior, N=18). The materials for all three priming tasks were balanced in lexical frequency based on the Russian National Corpus. Linear mixed-effects models were used to analyze the RT data.

A total of 400 word pairs were presented, in a pseudo-random mixing of the three item types. In the phonological priming items, participants heard pairs of words with at least a three-phoneme initial overlap, e.g., *parus*-*PARTA* ‘sail-desk’; there were 20 matched, 20 unmatched word-word pairs, and 20 matched, 20 unmatched word-nonword pairs. The results of phonological priming for NSs followed previously reported patterns of inhibition, which was stronger for high-frequency items. The highest-proficiency (ILR 3) L2 learners also showed inhibition for high-frequency items, but facilitation for low-frequency items. Two other groups with lower proficiency showed the same tendencies with neither being significant. Facilitation in response to low-frequency items resembles the response patterns to nonce targets observed in both NS and L2 learners. However, if facilitation were due to the lack of lexical knowledge, it would not increase in higher-proficiency learners compared to less proficient ones, since the size of the mental lexicon increases with higher proficiency. The study identifies two possible causes for the observed effects: the fuzziness of phonological representations of words in the mental lexicon and the smaller size of the cohort neighborhood. It breaks a new ground by showing L2 deficits in

relying on the phonological make-up of words for lexical access.

In the semantic priming experiment, the structure of the material was similar to phonological priming, with the primed pairs belonging to the same semantic field, as in *oxotnik*-RUZHJO “hunter-gun.” L2 learners showed expected facilitatory semantic priming effects, as did NSs of Russian. In L2 learners, the priming effects decreased for low-frequency items and at lower proficiency levels with no priming effects observed in ILR 2 learners for low-frequency items. Taken together, phonological and semantic priming results indicate that L2 learners experience difficulties both with phonological and semantic aspects of lexical access.

With regard to L2 morphological processing, two conflicting proposals have been made: The first is that L2 learners do not use combinatorial rules to decompose morphologically complex words into constituent morphemes, and store them as whole words instead (Clahsen et al 2010, Ullman 2001). Developmentally, they move from whole-word storage of inflected words to decomposition only when they reach the advanced proficiency level. The opposing claim is that late L2 learners do not store whole-word representations until they reach high proficiency levels, and access morphologically complex words by decomposition (Portin et al 2007). The study uses a pseudo-longitudinal design to establish the direction of the L2 developmental trajectory.

The morphological priming items explored morphological decomposition of inflected Russian verbs belonging to three types: regular, semi-regular, and irregular. The matched primes were in the 1st person singular, non-past tense, and the targets were the infinitives of the same verbs, with 240 verb pairs total. In the unmatched condition, the same targets were used with the 1st person singular of different verbs from the same frequency range as the matched primes. For example, the matched pair *noshu*-NOSIT’ (I carry-carry) corresponds to the unmatched pair *sluzhu*-NOSIT’ (I serve-carry).

Robust priming effects were observed for all three types of inflected verbs with graded regularity treated as transparency and complexity in stem allomorphy in native speakers of Russian. Similar effects were found in L2 learners of Russian at three proficiency levels for high-frequency verbs. Low-frequency verbs showed an interaction of the degree

of regularity with proficiency level, with priming effects for regular verbs at all three proficiency levels, semi-regular verbs at two higher levels, and irregular verbs only at the highest level. When the priming effects from semantic and phonological items from the same experiment were used as covariates, all morphological priming effects in NSs and L2 learners remained robust. Stem frequency effects were present in irregular verbs only in L2 learners; however, with semantic priming effects as a covariate, frequency became significant in irregular verbs also for NSs. This detracting role of semantic “primability” is interpreted as evidence in support of direct native access from sound to lexical meaning (cf. Bozic et al 2010).

The results of the morphological priming task indicate that in Russian, a highly inflected language, auditory lexical access of inflected words occurs in two stages: first, decomposition into stem and inflectional affix, and second, access of the stem representation at the lemma level, which can occur directly or by further decomposing the stem into root and suffix in a nesting doll pattern. The first stage takes place automatically both in NSs and L2 learners for all productive inflections, while the second is gradually acquired by late learners, from transparent and productive to opaque and unproductive stem allomorphy. This developmental tendency is in contrast to the claims that late second language learners store and access regularly inflected words undecomposed. It supports decomposition in L2 learners who gradually become more efficient in handling complex nontransparent stem allomorphy with ascending proficiency levels.

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EMOTIONAL VALENCE AND LANGUAGE PRODUCTION: ARE HAPPY SPEAKERS LESS EFFECTIVE COMMUNICATORS?

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Spoken language is full of ambiguity. Schober & Brennan (2003) have suggested that speaker variables are one potential source of variability in how effectively speakers communicate their messages. Growing evidence suggests that emotional valence is one such variable that may affect communicative effectiveness: Happy speakers are less polite and indirect in their request formulation (Forgas, 1999), make more egocentric inferences when interpreting ambiguous statements (Converse, Lin, Keysar & Epley, 2008), and tend to overestimate their communicative success (Fay, Page, Serfaty, Tai & Winkler, 2009). I will present results of two studies which examine the role of emotional valence in prosodic disambiguation and in lexical and syntactic ambiguity production.

In a first series of experiments (Kempe, Schaeffler & Thoresen, 2010), we asked mothers and non-mothers to instruct real and imaginary children to perform one of two possible actions using syntactically ambiguous sentences like *Touch the cat with the spoon*. The referential context contained both a spoon as well as two toy cats, one of which was holding a small spoon, thereby affording interpretations of the prepositional phrase as instrument of the action or as modifier of the first noun. Mothers generally produced more misleading prosodic cues suggesting that they failed to disambiguate the utterances. At the same time, mothers produced stronger positive vocal affect. Across all participants, degree of expressed positive vocal affect was negatively correlated with degree of prosodic disambiguation. Thus, the happier speakers' voices sounded the more likely they were to produce prosodic cues that were misaligned with the intended syntactic structure of an utterance suggesting a possible trade-off between affective and linguistic prosody which, in certain situations, may jeopardize communicative effectiveness.

In the next set of experiments, we used mood induction to manipulate emotional valence directly and to investigate whether it has an effect on ambiguity production. We compared happy and sad speakers in the extent to which they produced lexical and syntactic ambiguities in their speech. Participants were randomly assigned to either a happy condition (watching the "Bambi on ice"- cartoon scene from Walt Disney's movie *Bambi* accompanied by Mozart's *Rondo in G*), or

a sad condition (watching the "Death of Simba's father" – cartoon scene from Walt Disney's movie *The Lion King* accompanied by Barber's *Adagio for Strings*). Manipulation checks administered at the end of each experiment confirmed that the intended effect of the mood induction had persisted throughout the speaking task. In the first experiment, participants were asked to describe a series of four objects to a hypothetical addressee in a pre-specified order. In the critical trials, one homophone, e.g. an animal bat, appeared in third position followed by a second homophone, e.g. a baseball bat. Unambiguous identification of the referent requires modification of the homophone. The results showed that sad speakers were more likely to modify the second homophone thereby repairing a temporary lexical ambiguity (... *first cover the bat, then cover the baseball bat*...). In the second experiment, participants were shown arrays of objects and asked to formulate instructions for moving these objects around in space. In the critical trials, the arrays contained two exemplars of the same object so that identifying one of these objects to a potential addressee required a relative clause modification as in *Put the ball that's under the boot under the barn* for an array with two balls or *Put the ball under the boot that's under the barn* for an array with two boots. While there was no effect of emotional valence on production of reduced vs. unreduced relative clauses, happy speakers omitted the modifying relative clause altogether twice as often as sad speakers by producing ambiguous utterances like *Put the ball under the boot* when two balls were present in the array.

The findings presented here suggest that emotional valence may be one of the factors that modulate communicative effectiveness. One or several mechanisms could be responsible for this effect: First, if positive emotional valence is associated with overestimating one's communicative success then happy speakers may strategically allocate fewer resources to speech planning. Second, negative mood is associated with more deliberate, systematic and effortful processing in general, which may result in more systematic processing of the referential context. Thus, the happier speakers are the less likely they may be to spot the potential for ambiguity in the visual arrays in the first place. Third, more effortful processing associated with negative emotional valence may also facilitate perspective taking, which is considered to require effort. As a result, happy speakers may be less likely to engage in audience

design. Finally, more effortful processing may also benefit speech monitoring: Even if happy speakers keep track of their addressee's perspective they may fail to monitor how well their own utterances are aligned with that perspective. Future research will have to elucidate to what extent these mechanisms, which are not mutually exclusive, are responsible for the observed effect.

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VISUALLY SITUATED LANGUAGE COMPREHENSION: TOWARDS A TASK-BASED ACCOUNT AND REFINED LINKING ASSUMPTIONS

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Based on a review of recent findings, I will identify key characteristics of visually situated language comprehension. More specifically I will argue that both active visual context effects and the temporally coordinated interplay between visual attention and language comprehension are characteristic of situated comprehension, and are robust across a broad range of comprehension situations, spanning (a) different comprehension modalities (reading and spoken comprehension) and situations in which language is (versus isn't) in accord with visual context; (b) different kinds of visual contexts (clipart depictions but also

real-world objects and events); (c) speaker- based information such as eye-gaze and gestures; and (d) both concrete and abstract language. Because of their broad coverage ((a) – (d)), situated language comprehension paradigms are, in principle, well suited for developing a relatively comprehensive theory of situated language comprehension. Current weaknesses, however, are (i) the absence of more detailed linking hypotheses between comprehension processes and one of the key measures used to examine situated comprehension (visual attention to objects across time), as well as (ii) the absence of an explicit model of how (comprehension) sub-tasks affect visual attention and language comprehension. Refined linking hypotheses and a model of task are an important step for improving existing accounts of visually situated language comprehension.

ATTENTION, LANGUAGE, AND AFFORDANCES: AN EYE-TRACKING INVESTIGATION

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Apprehending a manipulable (e.g. graspable) object involves mentally representing its action-relevant features, or options for the agent's interactions with it. For example, apprehending

a target object with handle direction (e.g. rightward) congruent with response laterality (e.g. right hand) results in response facilitation (e.g. Ellis & Tucker, 2000). Such “affordances” are intrinsic features of the object's mental representation evoked automatically when the object is attended overtly (Tucker & Ellis, 1998; 2001; 2004) and covertly (Symes, et al., 2008). Affordance effects can result from viewing the object (Tucker & Ellis; 2001) or hearing its name (Tucker & Ellis, 2004). In addition, co-presence of a distractor object with similar affordance profile leads to inhibition of responses (Ellis, et al., 2007). However, how the co-presence

of linguistic and perceptual cues to the target object's identity affects the attribution of affordance effects remains debated.

In two eye-tracking experiments we investigated how activation of objects' manual affordances is triggered by perceptual and linguistic information about manipulable objects within vs. outside the focus of visual attention. In both studies, two manipulable objects first appeared on the screen in their natural colour. After a short delay, one of these objects turned green to reveal the identity of the target. The participants' task was to signal target detection by pressing a designated key. Participants' oculomotor behaviour was monitored throughout. Three factors were independently manipulated in Experiment 1: (1) the eventual target object was presented as congruent or incongruent with the lateral manual response, (2) the eventual distractor was also presented as response congruent or incongruent, and (3) the target object could appear within or outside of the participants' visual focus. In Experiment 2, in addition to these three factors, participants would hear the name of one of the two objects prior to the target display onset; hence, the interactive

ability of *linguistic* and *perceptual* cues to bring out affordance effects was analysed.

Target- and distractor-related affordance effects and their interactions were studied in both manual and oculomotor behaviour. The latter is important as it shows that attribution of affordance effects is a highly automatic process affecting cognitive processing at very early stages of object categorization. Importantly, the presence of both perceptual and linguistic cues affected an object's affordance profile: Both the target- and distractor-related affordance effects were stronger when the object was cued either visually or auditorily. However, Experiment 2 showed that only one cueing effect could be used at a time during object categorization, demonstrating competition between visual and linguistic object information. Finally, analysis of eye-tracking data showed that specific attention was paid to the manipulable parts of objects; viewers looked to the objects' handles (affordance-yielding object parts) rather than their bodies. Our results inform embodied theories of language comprehension and vision for action in their relation to object categorization and manual affordances.

OVERT AND COVERT ANTICIPATION OF VERB COMPLEMENTS IN THE VISUAL-WORLD PARADIGM

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Altmann & Kamide (1999; AK99) showed that listeners anticipate verb complements before they are available in the spoken input: while looking at scenes comprising, e.g., a boy, a cake, and some toys, participants listened to "the boy will eat [vs. move] the cake"; shortly after hearing "eat", participants were more likely (30% of the time) to launch anticipatory eye-movements to the critical target (cake) than after hearing "move" (20%). The present study replicated this design with an additional gaze-contingent picture change manipulation: if subjects were NOT fixating the target during a critical probing point in time (150ms before or 200ms after verb-offset), the target would "flicker" for two screen refreshes (16.6ms) in half of those trials (the remaining trials were controls). Eye-movements in response to this manipulation were taken as an index of

covert attention deployment (attending to the target without looking at it). In the late probing condition (200ms after verb-offset and 280ms before noun-onset), participants were generally more likely to look at the target in the "eat" rather than "move" condition (replicating AK99) while no verb-specific differences in flicker detection were established. In the early probing condition (150 ms before verb-offset), no general verb effect in looks to the target was found; however, perceivers were more likely (and faster!) to respond to the flicker manipulation in the "eat" rather than "move" condition, suggesting that they were covertly attending to the target while still processing "eat". We conclude that "standard" visual-world experiments may underestimate the speed and likelihood of object-anticipation, as anticipation is already reflected in the deployment of covert visual attention before the eyes actually start to move to the target location.

SENTENCE COMPREHENSION IN VEGETATIVE AND MINIMALLY CONSCIOUS STATE PATIENTS AND THEIR NEURONAL CORRELATES

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Abstract

Patients with altered states of consciousness continue to constitute a major challenge in terms of clinical assessment, treatment and daily management. Furthermore, the exploration of

brain function in severely brain-damaged patients represents a unique lesional approach to the scientific study of consciousness. Electroencephalography is one means of identifying covert behaviour in the absence of motor activity in these critically ill patients. Here we focus on a language processing task which assesses whether vegetative (n= 10) and minimally conscious state patients (n= 4) (vs control subjects, n= 14) understand semantic information on a sentence level (*"The opposite of black is... white/yellow/nice"*). Results indicate that only MCS but not VS patients show differential processing of unrelated ("nice") and antonym ("white") words in the form of parietal alpha (10–12Hz) event-related synchronization and desynchronization (ERS/ERD), respectively. Controls show a more typical pattern, characterized by alpha ERD in response to unrelated words and alpha ERS in response to antonyms.

INSTANTANEOUS NEURAL ACCESS TO MENTAL LEXICON AS A REFLEX

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It only takes some tens of milliseconds for the acoustic information to travel from our ears to pretty much anywhere in the brain. At the same time, the speed with which we are able to extract the information from this input can be crucial for our survival. So, can it be possible that even the most basic step of word understanding – lexical access – takes almost as long as half a second? Here, we will look at a series of studies aimed at investigating lexical access using a variety of paradigms. In this talk, we will explore the earliest neural reflections

of lexical processing that can be registered using time-resolved neurophysiological recordings. We will present data obtained in different languages using magneto- and electroencephalography, and show that, in the brain, lexical parameters of words are unambiguously accessed within the first 100–150 msec and very likely even earlier, at ~50 ms after the speech signal arrives in our ears, as our most recent MEG data show. We will explore the chronometry of successive brain area activations in the process of single word comprehension and, furthermore, suggest that the lexical circuitry in our brain activates automatically, similar to a reflex that does not require active conscious control to take place. This automaticity is essential for ensuring robustness and ease of speech communication, an integral part of everyday human behaviour.

Workshop “Spoken discourse corpora as a window on cognitive mechanisms of speech production” / Воркшоп «Электронные корпуса звучащей речи как инструмент изучения когнитивных механизмов речепорождения»

Ведущая: Вера Исааковна Подлесская
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THE RELATIONSHIP BETWEEN INFORMATION PATTERNING AND SYNTAX IN THE FRAME OF THE LANGUAGE INTO ACT THEORY

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The Language into Act Theory (LAcT- Cresti 2000, Cresti and Moneglia 2005, Moneglia 2011) is an extension of the Speech act theory (Austin 1962), which derives from corpus based and experimental research carried out on large spontaneous speech corpora during the last thirty years (see the LABLITA and C-ORAL-ROM corpora).

According to Austin, LAcT assumes that the utterance is the reference unit of spoken language. The utterance corresponds to a speech act and has a pragmatic definition. Again in accordance with Austin's work, speech acts are complex activities which are comprised of three simultaneous acts (locutionary, illocutionary, perlocutionary). LAcT

focuses on two differences with respect to classical speech act theory:

- the perlocutionary act is not defined in terms of non conventional intention/effects of the speech act, but is rather considered as its affective origin
- prosody is assumed to play a mandatory role in the linguistic performance of the utterance and it is essential to the accomplishment of its illocutionary force.

The overall architecture of LAcT can be summarized as follows:

- **Perlocutionary act:** affective unconscious impulse
- **Illocutionary act:** following the affective impulse, activation of a pragmatic behavioural schema, belonging to a conventional illocutionary repertory. The activation determines the

accomplishment of one illocutionary force expressed by one specific information unit (Comment IU). The Comment can combine with other optional IUs developing various pragmatic functions (textual or dialogical) with respect to it. The combination of the IUs constitutes the Information pattern of the utterance, which is a pragmatic structure

- **Prosodic Interface:** Mandatory activation between the information pattern and its locutionary performance (Firenzuoli 2003)

- **Locutionary act:** according to the prosodic interface, activation of the semantic/syntactic component.

Within LAcT the utterance is considered neither a strictly compositional entity (as a sentence/proposition should be) nor an entity mirroring the flow of thought (Chafe 1970). By virtue of its pragmatic nature the utterance ensures the accomplishment of a speech act within linguistic human dynamics, according to pragmatic devices and conditions.

IUs, that are also pragmatically defined, are linked to the others by specific informational relations, rather than syntactic rules (*accomplishment of the illocution, application field of the force, integration for the addressee, parenthesis, introduction to reported speech, allocution, maintenance of the communication channel*, etc.). Moreover each IU of the utterance necessarily corresponds to a specific prosodic unit (PU) that is identified by a prosodic break (*terminal, non terminal*, Izre'el 2005) and by perceptively relevant prosodic parameters (*prefix, root, suffix, parenthetical*, etc., t'Hart et al 1990).

In other words, each IU of an information pattern determines the boundary of its respective semantic/syntactic chunk, developing a pragmatic function so that the linguistic filling of a combination of IUs does not necessarily follow syntactic rules generating a well-formed sentence and does not form a proposition.

Coherently with these assumptions, the specific compositional level occurs only within each IU: IUs are islands from both a syntactic and a semantic point of view i.e. local configurations (in general, a phrase). Syntactic relations such as scope of predication, regency, modification, quantification, modality etc. fall inside the IU domain. The final linguistic entity corresponds to the combination of semantic/syntactic islands, bound mostly through anaphoric and paratactic relations.

In conclusion, LAcT does not foresee mismatches between syntax and prosody in spontaneous speech, since the starting point is the pragmatic nature of utterance. Indeed, the information patterning determines prosody, dominating the semantics and syntax of IUs.

The talk deals with two problems in the interface between syntax and prosody, which have been debated at length in the literature (Chafe, 1976, Lambrecht 1994, Krifka 2006, Blanche-Benveniste 2010, Sabio forthcoming), and which the LAcT framework provides an explanation for under the assumptions of the pragmatic nature of speech and the mandatory role of prosody:

- the difference between the Subject-Predicate semantic relation and the Topic-Comment pattern (Li 1976):

- A Topic-Comment utterance is scanned by a non-terminal break, and it is performed by one *prefix* and one *root* PU, giving rise to a relation of *pragmatic about-ness*

- the Subject-Predicate relation holds within a proposition, which must be prosodically integrated into one IU of some type. Subject and Predicate are bound in a sentence configuration and do not convey any relation of pragmatic about-ness (Cresti and Moneglia 2010)

- the classification of different types of subordination in spoken language according to prosodic conditions:

- strict subordination (clausal embedding or clausal adverbial composition) holds within a unique IU i.e. it is prosodically integrated and develops one information function within the IU

- kinds of subordination occur when clauses are performed in different IUs or in different utterances. In these cases they do not give rise to a syntactic configuration and each of them develops a distinct pragmatic function (Blanche-Benveniste 2010, Cresti and al. 2011, Cresti forthcoming, Sabio forthcoming).

The paper will present cross-linguistic evidence supporting the previous theoretical assumptions which are derived from the annotation of Italian, French (Cresti and Moneglia 2005) and Brazilian Portuguese (Raso and Mello 2011) spoken corpora.

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PROSODIC AND SEGMENTAL UNITS: A VIEW FROM SPOKEN ISRAELI HEBREW

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It has long been recognized that spoken language organizes itself in segments of speech that can be accounted for by their suprasegmental structure. The suprasegmental unit according to which segmentation of the spoken language can be made has been conceived to be dependent mainly on tone, or rather intonation, and has therefore been termed “tone group”, “intonation (al) phrase”, “intonation unit”, or the like (e.g., Beckman & Pierrehumbert 1986; Halliday 1989; Chafe 1994), where the identified prosodic stretch may be identical or different in some respects among the various approaches.

Whatever approach is taken, it seems that there is a wide consensus that this unit, which will be termed here “Prosodic Group” (henceforth: PG), encapsulates a coherent structural, functional segmental unit, be it syntactic, semantic, informational, or the like, and defines its boundaries. Segmentation into prosodic units has indeed been used successfully in transcribing large corpora (inter alia, Cresti & Moneglia 2005; Cheng, Greaves and Warren 2008; Kibrik & Podlesskaya 2009).

Terminology is not always explicit in this regard, as the stretch of speech defined by its prosodic features may be referred to by prosodic terminology. This is, e.g., Chafe’s cognitive approach, where

the term used is “Intonation Unit”, although it addresses the segmental unit encapsulated by the prosodic contour all the same. Explicit reference to the segmental unit varies, e.g., “Speech Unit” (Tao 1996), “Information Unit” (Halliday 2004), among others. Kibrik & Podlesskaya (2006) have suggested the term Elementary Discourse Unit (EDU), which is for them – as it is for Chafe – also a cognitive basic unit.

Looking at the interface between prosody and syntax, there seems to be a consensus as regards the syntactic unit encapsulated by a PG, and scholars from different theoretical orientations view the clause as the basic syntactic unit, suggesting that the PG/Intonation Unit/EDU is the natural domain of the clause (e.g., Chafe 1994; Kibrik & Podlesskaya 2006; Halliday 2004). However, for many languages, including Israeli Hebrew, the ratio of clauses to PGs may question such an assumption, as the find seems to be lower or only slightly higher than 50% of clauses per PG, depending on language and register (Izre’el 2005).

A different approach has been taken in the C-ORAL-ROM corpus (Cresti & Moneglia 2005), where the basic structural unit of spoken language is suggested to be the “Utterance”. An utterance may consist of one or more information units, where the final one ends in a terminal break and all previous units end in a non-terminal break.

In a preliminary study of CorpAfroAs (The Corpus of Afro-Asiatic Languages), two workable

prosodic units have been recognized: the Intonation Unit (our PG) and the Paratone. The latter has been defined prosodically similarly (but not identically) to C-ORAL-ROM's Utterance, a stretch of speech ending in a major (terminal) final boundary, where any (optional) previous IU carries a minor (continuing) boundary tone (Izre'el & Mettouchi, to appear).

Texts in spoken Israeli Hebrew, as represented in *The Corpus of Spoken Israeli Hebrew (CoSIH)* (see, for the time being, <http://www.tau.ac.il/humanities/semitic/cosih.html>), have been similarly segmented into PGs, indicating minor (continuing) units and major (terminal) units, thus enabling the detecting of paratones. As of now, "Paratone" is defined as a stretch of speech ending – as its default manifestation – in a terminal boundary tone. In my talk I will suggest a hierarchy among the different levels of discourse units similar to the one operable in CorpAfroAs and investigate the interface between prosodic and segmental units as follows:

Prosodic units	Discourse units	Syntactic Units
Paratone	Utterance	Clause
Prosodic Group	Speech Group	Phrase (Clause)
Minor		Clause (Clause complex)
Major		

(Lower (Prosodic/Phonological/Morphosyntactic Words and their building blocks) and higher units (Period) will be also specified, but not be evaluated. For previous account of prosodic hierarchy see, e.g., Shattuck-Hufnagel and Turk 1996)

My working hypothesis is that a Paratone is the default domain of the clause, whether it consists of a single PG or more. I will further suggest a classification of complex structures at the Paratone domain (e.g., ones including extrapositions, vocatives, discourse markers and other regulatory elements, lists, clause complexes, and others).

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TRANSCRIBING SPOKEN RUSSIAN DISCOURSE: THREE LEVELS OF COMPLEXITY

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Transcribing spoken discourse is not just a practical need, this is also a theoretical challenge. What kind of information should necessarily be extracted from the original audio signal and coded

in a graphical form, and which aspects may be neglected, so that the time spent on transcribing be reasonable, and the result reliable? Different answers have been given here so far, and various systems of discourse transcription have been proposed (see Du Bois et al. 1992, Chafe 1994, Cresti, Moneglia 2000 (eds.), Izre'el, Mettouchi to appear, inter alia). The diversity of approaches is obviously not accidental, since it reflects the

complexity of the phenomena one faces when analyzing natural oral data.

However, two principles are likely to be shared by virtually all transcription systems. It seems plausible that any transcription should express the ideas of *segmentation* and of *roles*, or *functions*, performed by the segmented units in a *more global structure*. The transcription system presented in this paper is no exception. Below is an excerpt from the “Night Dream Stories” corpus (see Kibrik, Podlesskaya 2009 (eds.) for details; glossing and English translation is provided for convenience only).

3. Вот я вышел из дома,
well I went.out of the.house
4. были ==
there.were
5. никого не было дома,
nobody not was at.home
6. мне оставили ключи.
to.me they.left the.keys

‘Well, I went outdoors, there were... there was nobody home, [my parents] had left me the keys’

The transcription presented above may be called *minimal*. It totally neglects numerous features of the original sound and focuses on two major points. First, each numbered line of the transcript corresponds to one *elementary discourse unit* (EDU), i.e. a simplest, basic step in discourse production. EDUs are delimited mainly on prosodic grounds, but we believe, following the works of Chafe, that this segmentation also has a strong cognitive motivation. Syntactically, most EDUs are simple clauses (see lines 3, 5 and 6), but this is rather a tendency, not a rule (see a fragmented EDU in line 4).

Second, lines have final punctuation marks. Some of these signal the completion of an utterance (see period in line 6; different marks are used for questions, directives and other illocutionary types), others indicate a non-final, “open” status of the EDU in an illocution (see lines 3 and 5; comma is the most frequent mark here, but not the only one), and still others mark interruptions and speech disfluencies (= in line 4).

Of course, there is much room to enrich this minimal notation, to make the transcription more elaborated. Look at the following example.

3. ... (0.5) Вот-х я-а вышел из /дома,
4. были-иh ==
5. ... (0.4) ээ(0.4) никого \не было -дома,
6. мне оставили \ключи.

This is the same excerpt we saw earlier, but the transcription is obviously more detailed. Here is a brief list of what was added: (i) silent and

filled pauses and their duration (see ... (0.5) in line 3 and ээ (0.4) – Russian analogue for English uh – in line 5); (ii) accents and pitch movements associated with them (see iconic slashes before accented words in lines 3, 5, 6); (iii) main (primary) accents (distinguished from secondary accents by underlying the accented vowel; see words дома in line 3, не in line 5, and ключи in line 6); (iv) lengthening of sounds, aspiration and other specific types of articulation (я-а in line 3 exemplifies lengthening, были-иh in line 4 exemplifies both lengthening and aspiration); (v) tempo alternations (italics are used to mark an accelerated speech production, see lines 5 and 6).

These phenomena are not just random properties of spoken discourse, they play crucial roles in the local structure organization. Pauses and (primary) accents help detect EDU boundaries; accents also highlight the portions of discourse that have more prominent informational status, while pitch movements determine the function of those portions (for instance, EDUs) in a broader context; filled pauses and sound lengthening are basic signals of hesitation; tempo acceleration is often used to mark a background information.

In the “Night Dream Stories” project the transcription exemplified above is called *complete*, though it should certainly be admitted that no transcription may be complete in a strict sense. Anyway, it is much richer, much more complex than the minimal version. As good as it is, this entails some problems. First of all, complete transcripts are harder to read. Second, a researcher may not need so many features included in transcription. And finally, creating a complete notation is an extremely laborious, time-consuming enterprise. There should be an intermediate level of complexity; in our project it is realized in the form of the *simplified* transcription. In this type of notation only the most important prosodic features are coded – main accents with pitch movements, silent and filled pauses (without indications of their precise duration), and sound lengthening; see example below.

To conclude, the paper presents three levels of graphical notation, which may also be considered as three consecutive steps in transcribing spoken discourse. The first step is to segment the speech into elementary discourse units and define their roles in the local structure – these solutions are reflected in the minimal transcription. The second step is to provide basic prosodic justifications for such solutions, locating pauses, primary accents and pitch movements – all these features are included in the simplified transcription. The third step, which results in the complete transcription, presupposes a subtle analysis of pauses duration,

secondary accents, tempo alternations, and specific articulation strategies.

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SPEECH REPORTING STRATEGIES IN RUSSIAN SPOKEN NARRATIVE

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Speech reporting¹ is one of the most common phenomena in spoken narrative as well as in written one. Traditionally speech reporting types (direct / indirect / semi-direct speech) were defined primarily on grammatical base and punctuation rules. In latest spoken discourse studies, though, it has been shown that direct, indirect and semi-direct speech are not grammatical categories, but rather tendencies or strategies based on a multivariable speaker's choice – selecting speech verbs, complementisers, using (or not) tense shift and other deixis changes, etc. However, the factors that influence speaker's choice in this case have not been thoroughly studied yet. The role of prosody as a part of these tendencies also requires additional research.

In this paper I will first briefly discuss these **various parameters that speech reporting strategies are based on**, relating to Russian language. For this research I use data from 3 Russian oral corpora “Night Dream Stories”, “Stories about presents and skiing” and “Siberian lifestories”; about 2h of sound in total. All 3 corpora are annotated for prosodic details, pausation and pitch movements. Apart from all the parameters already listed above (deixis changes, complementisers, discourse markers, etc) I will pay specific attention to such things as prosodic breaks (pitch resets, pauses), using accents in both framing clause and reported speech and other non-grammatical and non-lexical means used in speech reporting.

I propose to describe **speech reporting** as a **dynamical process** that simultaneously struggles a) to integrate the material that is being quoted into speaker's own discourse as much as possible,

and b) to relay the material that is being quoted as close to the ‘original’² as possible. Obviously, these two objectives are in controversy, and that is where I believe all the variety of speech reporting strategies root from. The first one requires changing the incorporated discourse in accordance with speaker's own purposes, thus leading to what is usually called *indirect speech*. The second one requires delivering something that is being retold as close to verbatim as possible, and the result is what is usually called *direct speech*. It is clear, though, that one of these two objectives prevailing totally over the other is never really the case; instead, the speaker chooses from a number of means to accomplish the purposes that are more important to him, according to the communicative situation. We need to use multivariable analysis to describe ‘direct speech’, ‘indirect speech’ and anything that lies in between and is usually called ‘semi-direct speech’.

Below there are three examples of speech reporting in the corpora. Direct speech (1) shows all the characteristics of such, like a verb in the imperative form *kupi* (buy) and the directive exclamation intonation pattern. Indirect speech (2) uses the complementiser *cto* (that) and the narrative intonation pattern. Semi-direct speech (3), while using a verb in the imperative form *voz'mite* (take) typical for direct speech, also uses a hedging expression *tam* (like, lit. there) that usually indicates reported speech and obviously is not part of the quotation. The intonation in this case is also that of a thoughtful narration, not of a direct speech, which is symbolized by dots (...) after the quotation mark.

¹ I am using the term ‘speech’ broadly here, as I analyze not only speech, but also thought and writing as they are reported in spoken discourse.

² The idea of an ‘original’ always existing is somewhat questionable in itself, and I will discuss it also. For now we will understand it as ‘something that both speaker and listener believe to have been said/ thought’.

- (1) /Oni emu skazali: “/–Kupi-ii ej mashinu!”
They him told buy-IMP her car-Acc
{They told him, “Buy her a car!”}
- (2) i \pozhalovalsya, chto ne mozhet pridumat’ mame \podarok.
and complained that NEG. can think-of-INF Mum-Dat present-Acc
{and complained [to the children] that he could not think of a present to [their] Mum.}
- (3) Nu emu tam /–reklami-irujut... tipa “Vot tam klassnyj takoj \avtomobil’...”
Now him like advertise-PresPl sort.of here like cool such automobile
{Now, they are sort of advertising [it] to him... like “That automobile is like very cool...
vot etot vot /–voz’mi-ite tamj”...
here this here take-IMP-Pl like
Like, take this one here.}

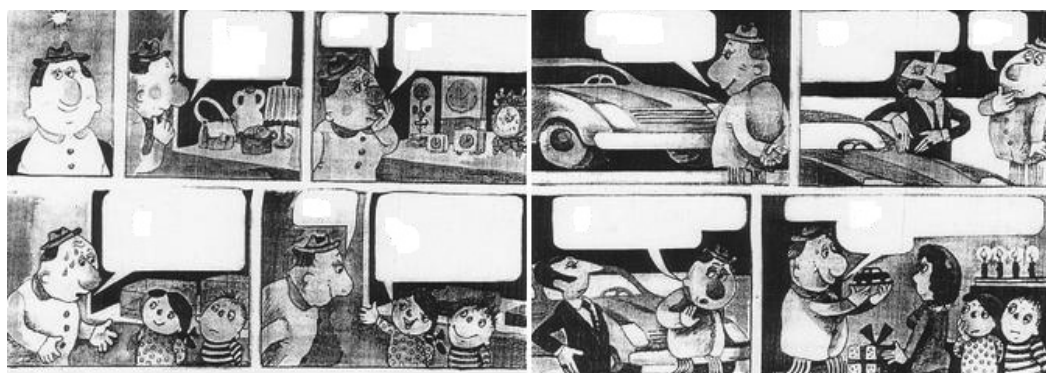
Second, I will discuss **possible factors that influence speakers** while choosing speech reporting strategy. This part of the research is based on the “Stories about presents and skiing” corpus. This corpus consists of stories produced by 10 adult native speakers, with a cartoon with empty speech ‘bubbles’ used as a stimulus (see *Pct. 1*). The experiment resulted in 2 sets of stories, the 1st one being produced while looking at the picture, and the 2nd one – several hours later, without the picture. To make it possible to analyze corresponding instances of reported speech from different speakers, we marked 10 positions in the pictures, where speech was possible.

Our research shows the following results. **1).** Not all such positions are actually used by speakers to produce reported speech. Sometimes speakers choose just to describe the results of the episode, not the process (*‘The kids advised him to buy a car’*). **2).** Direct speech seems not to be a prevailing type, at least in this case (though it definitely was in the “Night Dream Stories” corpus), and indirect speech is more frequently used. **3).** There is no significant difference between telling and retelling the story, considering the choice of speech-reporting strategies. **4).** Different episodes of the story seem to be described using one strategy

more often than the other. The importance of an episode for the story and the need to illustrate a hero’s characteristics seem to be significant factors. **5).** Thought and speech are also reported differently. Though all the strategies are used for both, thought is much more often reported as indirect speech. **6).** Personal preferences in style and the age of speakers should be also considered as significant factors for a speaker while choosing the most adequate form of speech reporting. In comparison with children (“Night Dream Stories”) adults use indirect speech more often.

This short research shows that speech reporting process is a complex phenomenon, and its components are obviously influenced by very different factors. While grammatical and lexical rules for ‘classical’ types of reported speech are well-described for many languages, the less strict parameters, such as prosody, are not so well studied. The factors that influence speaker’s choice are even less analyzed, and it stays unclear if these factors are universal to any extent or depend on specific language and culture.

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Picture 1. “Stories about presents” cartoon, Einfeld et al. 1983:71

SPEECH SEGMENTATION BY CLAUSAL AND NON-CLAUSAL BOUNDARIES IN JAPANESE

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Background

In spontaneous speech, the flow of utterance sometimes contains multiple clause linkage via adjective and/or coordinate clauses; such lengthy utterances lack explicit sentence boundaries, and thus should be split into basic units. Various proposals have been made to define basic units of spontaneous speech according to its various aspects: IU (Intonation Unit) by Chafe 1987; TCU (Turn Constructional Unit) by Sacks et al. 1974; AS-unit (Analysis of Speech Unit) by Foster et al. 2000. These proposals can be characterized by their viewpoint on segmentation: intonational unit, communicative unit, and syntactic unit. As for syntactic units, grammatical clues should be analyzed to split an utterance into basic units such that each unit comprises a syntactic entity. Thus, an individual criterion must be carefully designed for each language, specific to its syntactic features.

In this paper, I will introduce a technique to segment spontaneous Japanese speech into syntactic units with clausal and non-clausal boundaries. Considering morpho-syntactic clues of adjective and coordinate clauses, major breaks in syntactic constituents, corresponding also to intonational boundaries, are determined.

Clause Boundaries in Japanese

Typologically Japanese is an SOV language, and predicates are placed at the end of each clause. A predicate may consist of a verb phrase, an adjective phrase, or a noun phrase with a copula marker, following some grammatical constituents hierarchically: voice, aspect, polarity, tense, and modal expressions. Adjective and coordinate clauses can be classified into three levels (Minami 1974), whose final boundaries are marked morpho-syntactically and/or semantically by conjunctive particles (henceforth, CP).

For example, a subordinate clause led by CP *nagara* (-ing) means simultaneous action; it never includes a tense marker within the clause. The agent of simultaneous action must be PRO, which is governed by the subject of the main clause. Thus a *nagara*-clause can be regarded as belonging to a non-tensed level within a proposition. On the other hand, a subordinate clause led by CP *node* (because), which expresses a causal relationship, can include a tense marker and an independent

subject within the clause. Thus, a *node*-clause can be regarded as belonging to a tensed level. Finally, a coordinate clause led by CP *ga* (but) can include a tense marker, an independent subject, and modal expressions within the clause. Thus, a *ga*-clause can be regarded as on a modal level, this is close to being an independent single sentence.

Comparing the degree of independence among these three clauses, *ga* is most highly independent from the main clause, *node* lines in the middle, and *nagara* is strongly dependent on the main clause. Minami 1974 classified *nagara* as belonging to Level A, *node* to Level B, and *ga* to Level C according to their syntactic features. A *ga*-clause has nearly the same status as a single sentence, but a *nagara*-clause simply adds material to a proposition.

Speech Segmentation with Clause Boundaries

Using morpho-syntactic clues embedded in predicates, we can detect and annotate Japanese clause boundaries with their levels, and use them as keys for speech segmentation. A final boundary of Level-C clauses, which contain a subject and a predicate with modal expressions, can be regarded as a point at which an utterance should be split into clausal units. We also split an utterance after the boundary of a Level-B clause, but only when a conjunction, which can be regarded as a syntactic restart, follows after the boundary. Explicit sentence-final boundaries (Level D) can also break an utterance naturally.

We listed and classified up to 49 morphological types of Japanese clause boundaries according to syntactic levels, and then defined conditions for when these boundaries can or cannot be a suitable splitting point. Next, we adopted this principle to a large speech corpus, “Corpus of Spontaneous Japanese (CSJ)” released to the public in 2004. CSJ consists of 3302 samples, 651 hours, and 7.52 million words of spontaneous speech, mostly monologs but partly dialogs. Especially in monologs, each utterance tends to be long, containing adjective and/or coordinate clauses; however, our technique of segmentation can split long utterances into shorter, consistent syntactic units.

Disfluencies and (non-) clause boundaries

Various types of disfluent phenomena are frequently observed in spontaneous speech, such as, interjections, repetitions, self-repairs, inversions, insertions, false starts. Since these phenomena often cause difficulties in extracting a certain syntactic entity, explicit procedures must be defined to deal with such problems.

For example, a speaker sometimes inserts an independent syntactic chunk in the middle of an utterance. The syntactic boundary at the end of the inserted chunk should not be a segmentation point.

(1) *osake to menyū wa sukunaindesu-ga syokuji ga oitearimasu*

liquors and there is a limited menu, but meals are served

In the example (1), we see that the coordinate *ga*-clause (underlined) is inserted in the middle of a noun phrase: “*osake to | syokuji*” (“liquors and | meals”), where “|” indicates inserted position. This *ga*-clause works as a “proviso” or explanatory note to the following element *syokuji* (meal), and thus is not a suitable point to segment the utterance.

In contrast, sometimes we must allow non-clausal boundaries to extract syntactic chunks,

particularly when the utterance definitely consists of one word. It is ever valuable and an ongoing work to analyze clause-linkage patterns in various languages, and examine the principles necessary to split utterances into syntactic units.

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RUSSIAN COMPLEMENT CLAUSES IN PROSODICALLY ANNOTATED SPOKEN CORPORA

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1. The “mainstream” typology of clause combining limits itself primarily with grammatical parameters of cross-linguistic variation. In the case of complementation, two main parameters are usually considered: (a) presence vs. absence of the segmental linkage marker (complementizer, adposition etc.); and (b) the degree of clause deranking, or downgrading (i.e. the use of non-finite forms, clause-union effects etc.). Prosodic parameters, until recently, have been mentioned only marginally, if at all. Rare exceptions include, *inter alia*, Croft (1995, 2001); Mithun (1988, 2009); Michaelis (1994); Givón (2009); Noonan (2007); Raible (2001) – who explicitly state that the integration of combined clauses may be signaled by prosodic means. However, no systematic analysis has been done so far to identify specific prosodic features that could be treated either as linkage markers, or as markers of clause deranking in natural discourse. The paper aims at partially bridging this gap.

The paper is based on the data from three Russian oral corpora systematically annotated for prosodic details, incl. pausation and pitch movements: “Night Dream Stories”, 1h 50 min of sounding, “Stories about presents and skiing”, 35 min of sounding, and “Siberian lifestories”, 38 min of sounding. The first corpus is already published,

cf. Kibrik, Podlesskaya 2009; pilot versions of the two other corpora are now being prepared for the release.

2. I will consider Russian “trivially” shaped right-branched complement-clause (CC) constructions where (1) the subordinate clause is introduced by a complementizer; and (2) both the main and the subordinated clause are headed by a finite verb.

Among thus (grammatically) shaped CC constructions, three main types will be distinguished with regard to prosodic signals of (a) clause linkage; and (b) clause deranking:

- **a default type** with prosodically signaled clause linkage, but no prosodic symptoms of clause deranking;
- **an integrated type** with prosody marking both clause linkage and clause deranking; and
- **a disintegrated type** with no prosodic signals either of clause linkage or of clause deranking

3. In the **default type**, cf. (1), both clauses have their internal information structure marked by prosodic means, first and foremost, by the phrasal accent placement – each clause must have its own rhematic accent, or main phrasal accent (on *istoriju* in the main clause and on *zoo-parke* in the CC)¹.

¹ *Breaking into intonational phrases is shown in the original text – by breaking into lines, and also in translation – by bold curly brackets; slashes iconically show the direction of the pitch movement, the placement of the rhematic accent is shown by underlying the respective syllable.*

Each clause may also have one or more (additional) thematic accents (on *ja* in the main clause and on *žizni* in the CC). There is a prosodic break between two clauses evidenced by pitch reset, anacrusis

effects etc. Clause linkage is marked by the non-terminal pitch movements associated with the rhematic accent of the main clause – most often this is some sort of a rising pitch (on *istoriju*):

- (1) *Λja rasskažu tebe /istoriju,*
 I will.tell you the.story
o tom kak ja v pervye v \ žizni byla v moskovskom \zoo parke
 about that how I for.the.first.time in life went to Moscow zoo
 “{I will tell you the story}, {how I went to the Moscow Zoo for the first time in my life}.

4. In the **integrated type**, the CC construction has a united information structure with a single rhematic accent placed either within the CC, cf. (2), or (rarely) within the main clause. Loosing clause-internal information structure appears to be the most important prosodic signal of clause deranking within the construction. If the CC construction

of the integrated type does not have additional thematic accents, as in (2), the whole construction is articulated as a single prosodic phrase with no internal prosodic breaks. Neither there are any prosodic symptoms of clause-linkage – since there are no prosodic groups to be linked:

- (2) *i skazala čto tam nikogo /net!*
 and told that there nobody present.NEG
 “{and told that there [is] nobody there} “

The CC construction of the integrated type may have an additional thematic accent which can be realized either on the “former” CC theme, cf. (3), or on the “former” main clause theme, cf. (4). This

causes an evident discrepancy between grammatical and prosodic shaping, since the prosodic boundary appears either inside the CC, as in (3), or inside the main clause, as in (4), but never on the clause border:

- (3) *I-i on rešil čto-o ix semejnij /bjudžet etogo ne \potjanet*
 and he decided that their family budget this.ACC NEG stand
 “{and he decided that their family budget} {couldn’t stand it} “
 (4) *prosto Λmužiki porekomendovali čto tipa Λopytnyj,*
 just folks recommended that like experienced
 “{just folks} {recommended [me to the boss] [they said] that [he is] like experienced} “

5. In the CC construction of the **disintegrated type** cf. (5), just as in the default case, both clauses are not prosodically deranked – they have their internal information structure, i.e. each clause has its own rhematic accent and may also have one or more (additional) thematic accents. There is a prosodic break between two clauses evidenced by pitch reset, anacrusis effects etc. The essential difference

between the default type and the disintegrated type is that the first clause is produced with terminal pitch movements (most often, though not always, this is some sort of a falling pitch) which do not build up an expectation for a continuation. In other words, in spite of the fact that the CC grammatically is introduced by a “true” complementizer, prosodic symptoms of clause linkage are absent:

- (5) *Mne prisnilsja \son.*
 I dreamed a.dream
√Čto-o ee nedav= ja i= begu po /bol’nice-e,
 that uh recen= I am.go= am.running through a.hospital
 “{I dreamed a dream.} {That uh recen=I am go= running through a hospital.} “

Our corpus data allows to demonstrate at least the following three functional reasons for this phenomenon, otherwise labeled as “fragmentation of CCs”: (a) the CC can be produced as an afterthought as a result of speech disfluency, cf. (5); (b) the CC is involved in a specific “listing strategy” of narration (a

monotonous storytelling) with all clauses – no matter main or subordinate – produced with same “open list” pitch movements (typically these are rise-level tones); and (c) the CC may appear after the speaker’s sudden twist from the initially intended direct speech to the indirect speech.

6. Even this short illustration shows that prosodic phrasing is a multifactorial process influenced by various structural and speech production parameters. It is not clear yet, to what extent these parameters are universal. Regarding CC constructions, so far, very little is known about their cross-linguistic prosodic variation. I will present qualitative and quantitative

results to show that natural corpus data can help not only in discovering actual prosodic patterns, but also in understanding why some possible prosodic phrasing patterns remain underrepresented, while others are favored in particular discourse settings.

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THE PRONOMINAL NATURE OF HESITATION DISFLUENCIES: EVIDENCE FROM SPONTANEOUS SPOKEN HEBREW

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In the present research I investigate the phenomenon of hesitation disfluencies (HD) in spontaneous Israeli Hebrew. HDs are defined as prosodic manipulation of the speaker, produced by excessive elongation of a syllable (see Silber-Varod 2010 for a detailed definition of the phonological realization of HDs).

The cognitive function of HD is dealt with several theories (Hudson *inter alia* 1993, Ariel 1990, Clark and Wasow 1998), with respect to the part that the mental lexicon plays in the speech process. In the study of disfluencies such as “filled pauses”, a major approach views them as indicators of increased cognitive processing (*inter alia*, Shriberg 2001; Clark and Wasow 1998). For example, Shriberg (2001) claims that disfluency rates depend on the length and complexity of the sentence (Shriberg 2001, 157). Clark and Wasow (1998) showed that in American English, complex syntactic structures predict repetitions of function words. Their findings led them to formulate the *commit-and-restore model* of repeated words (Clark and Wasow 1998, 203) and to propose the Complexity Hypothesis. For example, they showed that speakers repeat the definite article *the* when it precedes a complex noun phrase. Roll, Frid, and Horne (2007) concluded that, in Swedish, a disfluent *att* “that” is evidence of cognitive processing of more complex syntactic structures. Drescher (1994) showed that a kind of complexity approach was also implemented on the Tiberian Hebrew accent system (*te’amim*). Drescher (1994) brings examples of subjects preceding verbs, where the combination of the subject and the verb varies in terms of complexity. He demonstrated two cases of long subjects and relatively short verb phrases, where the main break (*pause* in Drescher’s terminology) falls between the subject and the verb; and two other cases with short subjects, where the

main break falls after the verb: “The difference between the two types of cases has to do with the length and prosodic complexity (i.e. number of phrases) of the subject relative to the verb phrase” (Drescher 1994, 25).

The results of the present research on spontaneous Hebrew showed that HDs occur within syntactic units, even intra-phrases or intra-morphemes, and basically that these hesitated increments are function words. Moreover, according to the results of the present research, the elongated words vary in terms of complexity. For example, two of the elongated words with the highest probability are [ha] “the”, [el] “of” and 2 prepositions [be] and [le], which predict simple structures to follow them – a noun or a proper name or any other pronoun. The results show that there is wide variation in the following elements to the HDs, and this for itself is a simple argument that rejects complexity as an ultimate explanation for the HD phenomenon, since results showed no priority to complex structures, neither in the elongated lexemes nor in the expected following structures. Another argument are cases of elongated construct state nouns and infinitive prefixes, with the prediction of only simple following structures, a noun and a gerund, respectively.

Therefore, it is argued that a more adequate theories which can explain why speakers mainly elongate before nouns and verbs might be the following ones: Ariel (2001) argues that the ease with which a piece of given information is processed reflects its degree of mental accessibility, and that representations of linguistic material and physically salient objects are assumed to be in the short-term working memory, as opposed to representations of encyclopedic knowledge, which are assumed to be in long-term memory. Two principal criteria of AT associated with specific degrees of accessibility may be relevant to explaining the following elements: The first is informativity. Accessibility markers representing a low degree of accessibility incorporate more lexical information than those representing a high

degree of accessibility (e.g. open lexical categories vs. closed categories). Second, the attenuation criterion (phonological size) states that all things being equal, the less accessible an entity referred to by an expression is, the larger the expression is phonologically. This criterion also refers to the difference between stressed and unstressed forms. Shorter and unstressed forms have a higher degree of accessibility (e.g., CV function words, as [be] “in”) than longer and stressed forms (e.g., verbs, proper names, etc.). When Hudson (1993) compares constituency theory and dependency theory with respect to the load on working memory, he argues that Dependency Grammar theory allows us to count the number of active dependencies, defining a dependency as active if either the head or the dependent are still awaited. An active dependency is satisfied as soon as the word concerned is encountered (1993, 275–279). At that point, the burden on the working memory decreases and more space remains for continuous processing of information. Thus, as opposed to the complexity hypothesis, HDs phenomenon can be explained by AT and Hudson’s “active dependency” as a working memory load that is about to be satisfied.

Nonetheless, the explanation that is taken to apply to the findings of the present research, is that of “syntactic planning coming before lexical planning” (Blanche-Benveniste 2007, 61). To this statement, I add another term – the *placeholder* (Podlesskaya 2010). In spontaneous speech, placeholders “mainly have a pronominal origin and serve as a preparatory substitute for a delayed constituent” (Podlesskaya 2010, 11) and placeholders are “among other lexical and grammatical resources that allow the speaker to refer to object and events for which the speaker fails to retrieve the exact name, or simply finds the exact name to be unnecessary or inappropriate” (ibid.). Both Blanche-Benveniste (2007) and Podlesskaya (2010) assume the pronominal nature of disfluencies or placeholders. In this respect, I adopt this approach by saying that HDs are

prosodic morphemes which also have a pronominal nature. This is to say that speakers first utter the syntactic frame with the *lead*, the lexical element that “carries” the HD with its pronominal nature. The lead is expected to be followed by a *syntactic increment* or a *target word*. The conclusion is that by the elongated production of function words the expected syntactic structure is already indicated, i.e. the syntactic structure is thus complete. In other words, the following lexeme (s) to the HD does not contribute a fundamental increment to the *structure*, only to the *content*. This mechanism reduces the burden of the working memory, and thus enables processing of new information.

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PITCH ACCENTS AND ACCENT PLACEMENT AS FACTORS OF ORAL SPEECH SEGMENTATION

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It is widely recognized that intonation units do not always coincide with full grammatical units (Croft 1995, Steedman 2007). However, the very assumption that they could or should be seems to

be based primarily on the restrictions of the English grammar. Intonation does not express the syntactic structure but rather the theme-rheme structure, contrast, emphasis, various illocutionary meanings, and discourse links. It divides discourse into relevant communicative constituents. A language with fewer limitations on syntactic representation of communicative constituents like Russian could,

In example (3), which has a syntactic structure of a simple sentence, the theme, the rheme, and the discourse link have autonomous accent-bearers. Sentence (3) is taken from the Russian annotated speech oral corpus “Stories about presents and skiing”; cf. Podlesskaya (the present collection). The speaker recites a story about a young man who went skiing after a heavy breakfast with a good glass of wine. The setting makes the hearer expect information about how the skiing went off. The communicative structure of sentence (3) therefore contains a segment referring to what kind of event took place (expressed here by the verb *pokatajsja* “skied” which carries a prominent rise on the stressed syllable) as the initial theme. The adverbial phrase *ne ochenj udachno* “not very successfully”

- (3) *Pokatajsja on ne ochenj udachno...*
 LH*L% LH*L% HL*L% HL*H%
 Skied he not very successfully
 “His skiing was not a success”

To conclude, discourse units in Russian may have prosodic markers distinct from those delimiting theme and rheme. I will further present a variety of similar prosodic strategies together with their English, Polish, and German counterparts (if any) and give detail on the due pitch accents and accent placement.

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is the rheme. The rheme refers to how the event succeeded. The accent-bearer of the rheme the phonetic word *ne ochenj* “not very” carries a specific accent of an emphatic rheme. The emphasis here completely agrees with the meaning of the word *ochenj* “very”. The sentence-final *udachno* “successfully” carries a “scooped” accent HL*H%. This accent-bearer cannot be accounted for by the principles of the theme-rheme accent placement. It is an additional and autonomous marker of a discourse link. Besides, the sentence has a second theme *on* “he” carrying a rise. Relevant segments in (3) are therefore the themes *pokatajsja* and *on*, the rheme *ne ochenj udachno*, and a discourse unit the whole sentence *Pokatajsja on ne ochenj udachno*.

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THE PROSODY OF SUBJECTS AND TOPICS: A VIEW FROM SPOKEN ISRAELI HEBREW AND BEJA

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This paper discusses findings about the interface between subject, topic and prosody in spontaneous spoken data from two Afroasiatic languages, Spoken Israeli Hebrew (Semitic), and Beja (North-Cushitic) recorded in their natural environments. The data extracted from the CorpAfroAs pilot corpus (<http://corpafroas.tge-adonis.fr>) is segmented following the functional dichotomy between major and minor prosodic

breaks, indicating terminal and continuing boundary tones by perception.

In Corpafras project it was decided to use four major perceptual and acoustic cues for boundary recognition: (1) final lengthening; (2) initial rush; (3) pitch reset; (4) pause (cf. Du Bois et al. 1992; Hirst and Di Cristo 1998).

For both languages, it could be proved that speech processing of spontaneous spoken discourse is dependent on prosodic boundaries and pauses. Intonation units, resulting from the segmentation into minor (non terminal break) and major (terminal break) units do not necessarily match complete syntactic units.

In this research we propose cross-linguistic analysis of the prosodic features of clause types including pronominal subject, nominal subject and topic.

Section 1 is dedicated to the study of the interface between two kinds of syntactic subjects

(pronominal and nominal), separated from the rest of the clause, and their prosodic boundaries.

In example (1) from Beja, the nominal subject is separated from the verb by a pause. This nominal subject is an independent minor intonation unit for itself.

- (1) 'ka: me/ 524' 'ho: k'w'i'dij ini //
 camel=1SG.N 1SG.ACC disappearar-PFV.3SG say\ PFV.3SG.M
 My camel... disappeared, he said.

Regarding subject prosodic types very little is known about functional differences between the subject in a minor intonation unit and the subject in a major unit as well as about functional differences between the subject (in a distinct intonation unit) separated by a pause from the rest of the clause and the subject (also in a distinct intonation unit) but not separated by a pause. We will present some qualitative results regarding these questions.

In Section 2, we show that pauses are far from being always linked to repairs, and hesitations, and may serve as a criterion to distinguish

between syntactic subject and topic. Further more, occurrence of pauses, minor and major prosodic breaks after or before the head noun (depending on the word order of each individual language) cannot be systematically analyzed as a topic left dislocation. (cf. the same results for spoken French in Blanche-Benveniste, 2010: 171–174).

In section 3, we deal specially with clauses where the pronominal subject is repeated. It will be showed then that distinction between pronominal topic and pronominal subject repetition was hard to establish (cf. example 2 in Spoken Israeli Hebrew).

- (2) ani // aniosa dvavim axe# //²
 SUBJ1.SG SUBJ1.SG= do\ACT.PTCP thing-M.PL FS
 I I do other things

Our non-definitive conclusion of this work in process is that there is no one-to-one relationship between minor or major boundaries and subject and topic functions.

Our hypothesis is that distinguishing between topic and subject has to be based on both prosodic and syntactic criteria. However, distinguishing between repetition and topic remains to be achieved.

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1 Duration of the pause in milliseconds

2 Abbreviations list: ACC-accusative, ACT.PTCP-active-participle, IDP-independent, PFV-perfective, PRO- pronoun, M- masculine, PL- plural, FS-false start, 3-third person, SG-singular, SUB- subject, SUB1-first person subject pronoun.

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Воркшоп «Высшие когнитивные функции животных» / Workshop “Higher cognitive functions of animals”

Ведущие: Марина Ванчатова,
Зоя Александровна Зорина
Chairs: Marina Vančatová, Zoya A. Zorina

КОГНИТИВНЫЙ ПОТЕНЦИАЛ «ИНТЕЛЛЕКТУАЛЬНОЙ ЭЛИТЫ» МУРАВЕЙНИКА: ПОВЕДЕНЧЕСКИЙ ПОРТРЕТ РАЗВЕДЧИКОВ

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Исследование когнитивной и социальной специализаций в сообществах животных – новая область когнитивной этологии, открывающая, с одной стороны, перспективу исследования над-организменных систем в свете когнитивной науки, а с другой стороны, дающая пищу для продуктивных аналогий с ролевой организацией человеческих сообществ (Reznikova, 2007). Когнитивные аспекты разделения труда у общественных насекомых исследуются лишь с недавнего времени, когда стало известно об их значительном интеллектуальном потенциале. Так, у рыжих лесных муравьев разведчики, занимающиеся поиском пищи в сложных ситуациях, оказались способны улавливать закономерности

и использовать простые арифметические операции для оптимизации своей коммуникации с фуражирами (Reznikova, Ryabko, 2011). В основе столь эффективной коммуникации у муравьев лежит глубокая «профессиональная» специализация. Эксперименты с особями разного возраста выявили этологическую основу этого явления: агрессивные муравьи, не способные избегать опасности, специализируются как охотники и охранники, а особи, избегающие опасных столкновений и проявляющие склонность накапливать опыт, становятся сборщиками пади (Яковлев, 2010). Оставался открытым вопрос о ключевых свойствах разведчиков – «интеллектуальной элиты» муравьиной семьи, составляющей около 3% от общего числа внегнздовых рабочих.

Данная работа является первым шагом на пути раскрытия когнитивного потенциала и поведенческих особенностей членов этой функциональной группы. Мы поставили следующие задачи: (1) выявить характеристики исследовательского и агрессивного поведения

разведчиков и фуражиров, отличающие их от внегнздовых муравьев, собранных случайным образом; (2) исследовать способность муравьев запоминать и хранить информацию об устройстве лабиринтов разной сложности.

Использовался лабиринт «бинарное дерево» (Резникова, Рябко, 1990), методика тестирования исследовательской активности муравьев и круговой лабиринт (Reznikova, 2007). Две лабораторные семьи *Formica aquilonia* (1.5–2 тыс.) содержали на аренах, разгороженных на две части: жилую, где находилось гнездо, и рабочую, где находилось «бинарное дерево» (от 3 до 5 развилок). Кормушка с сиропом предлагалась семье раз в 2–3 суток на одной из веточек лабиринта. Состав рабочих групп муравьев выявляли в предварительной фазе эксперимента (3 недели), сопровождавшейся индивидуальным мечением. Разведчиков (n=15) отбирали из особей, которые первыми обследуют установку в поисках кормушки, по пути в гнездо активно контактируют с группами из 2–6 муравьев и совершают несколько таких рейсов за день. Фуражиров (n=36) собирали из особей, появляющихся на установке после контакта с разведчиками. В качестве контрольной использовали группу муравьев (n=20), собранных случайным образом на жилой части арены. Поведенческие характеристики муравьев изучали в индивидуальных тестах, моделирующих природные ситуации. Исследовательское поведение муравьев оценивали, помещая их по одному на арену диаметром 20 см с предметами, имитирующими толщину травостоя, ствол дерева и природное укрытие. Фиксировали время подвижности/неподвижности муравьев и время их пребывания на разных предметах. Уровень агрессивности муравьев определяли, ссаживая их по одному с «врагами» – хищными жуками (метод см: Дорошева и др., 2011). Подсчитывали частоту нападения муравьев на жуков и частоту отдельных реакций в этограммах. Способность муравьев запоминать путь в гнездо и хранить эту информацию изучали в опытах с (1) круговым лабиринтом и (2) бинарным лабиринтом. В первой серии опытов фиксировали время, потраченное муравьем на выход из лабиринта в ознакомительном и повторных тестах (спустя 2 и 24 часа). Во второй серии опытов муравья помещали на основание «бинарного дерева», одна из восьми веток которого вела к гнезду, и отмечали время нахождения на установке и количество обследованных тупиковых веток. Спустя разные промежутки времени муравьев тестировали повторно.

Характеристики исследовательского поведения разведчиков отличали их от двух других

изученных нами групп. Разведчики обладают наибольшей подвижностью: в перемещении по арене они проводили в среднем 87% времени, тогда как фуражиры и представители контрольной группы – 68 и 45%. Уровень исследовательской активности разведчиков оказался самым высоким: на обследование находящихся на арене предметов они тратили в среднем 13,8% времени, тогда как фуражиры – лишь 5,9%, а контрольные особи – 5,5%. Особенно привлекательными для разведчиков были предметы, имитирующие толщину травостоя и ствол дерева (7,6 и 3,7% времени). Доля времени, проведенного в укрытии, от суммарного времени, потраченного на взаимодействие с предметами, у разведчиков оказалась намного меньше, чем у фуражиров и в контроле (29, 62 и 70%, соответственно); таким образом, разведчики наименее «пугливы».

В столкновениях с «врагом» разведчики чаще членов других групп проявляли реакции обследования: ощупывали жуков антеннами, забирались на них, покусывали. Проявляемые в независимых тестах исследовательская активность и агрессивность муравьев оказались связаны между собой по типу «поведенческого синдрома» (Sih et al., 2004). Муравьи, которые в исследовательском тесте большую часть времени провели в укрытии (высокая «пугливость»), в тесте с «врагом» уклонялись от прямых столкновений.

Через 2 часа после ознакомления с круговым лабиринтом муравьи тратили на поиск выхода из него около 10 секунд, а спустя сутки – втрое больше времени. В опытах с бинарным лабиринтом муравьи показали наилучший результат (наименьшее количество обследованных тупиковых веток и, соответственно, наименьшее время поиска) при тестировании в период от 0,5 ч до 1 ч после знакомства с установкой, далее оба показателя постепенно ухудшались. Наблюдаемые эффекты могут объясняться угасанием памяти об устройстве лабиринтов. Кроме того, на результаты тестов могла повлиять исследовательская активность муравьев (в особенности это касается разведчиков и фуражиров).

Судя по полученным данным, наиболее характерной поведенческой чертой разведчиков следует считать исследовательскую активность. Проявлению этого основного качества способствуют высокая подвижность, отсутствие «пугливости» и в меру выраженная агрессивность.

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ИГРОВОЕ ПОВЕДЕНИЕ У ЧЕЛОВЕКООБРАЗНЫХ ОБЕЗЬЯН НА ПРИМЕРЕ ГРУППЫ ГОРИЛЛ ИЗ ПРАЖСКОГО ЗООПАРКА

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Игровое поведение у животных, включая приматов, занимает незначительное место в исследованиях поведения животных. Отчасти это вызвано тем, что такое поведение встречается прежде всего у очень молодых животных и, особенно в природе, встречается по сравнению с другими видами поведения мало. Кроме того, определение понятия «игра» у животных не имеет четкого описания. Игра часто считается незрелым поведением животных или подражанием поведению в обычной жизни. Одна из теорий основана на том, что игра – это деятельность, которой занимается успокоенное с других точек зрения животное и что такое поведение не служит никакой другой цели. Другая теория основана на том, что игра – это способ подготовки детеныша к проблемам взрослой реальной жизни.

Д. Лэнси (1980) определяет четыре основных характеристики игры:

1. Движения, которые встречаются в игровом поведении, часто можно наблюдать и в других типах активности, например, охота, спаривание, т.е. игра – это в сущности «измененное» или преувеличенное обычное поведение. Поведение, которое обычно наблюдается у животных, в данном случае трансформировано в поведение с игровым контекстом.

2. Животное не ожидает, что от игры получит какую-нибудь пользу. Т.е. животное играет без дальнейшей цели.

3. Животное играет добровольно. Игровые сигналы, которыми животное вызывает другого к игре, можно считать приглашением, которое другое животное может игнорировать или вступить в игру (например, «игровое лицо» у шимпанзе).

4. Для игры необходима благоприятная среда. Голодное животное, больное, которому холодно или жарко, которое не чувствует себя в безопасности, играть не будет.

Игры у приматов можно разделить на несколько групп. Например, конкурентные игры, при которых животные воюют между собой за территорию или ценные для них предметы. Манипуляционные игры – это игры с предметами, совместные или индивидуальные игры, при которых животное может манипулировать с предметом, само с собой или с другим индивидуумом. При подражательных играх одно животное подражает поведению другого. Необходимость игровых стимулов выше у животных в неволе, где нет необходимости искать пищу или избегать хищников. Особенно у человекообразных обезьян в неволе можно наблюдать игровое поведение не только у молодых животных, но и у половозрелых.

Бекофф и Байерс (1981) считают, что главная функция игры – это сохранение социальной стабильности в группе. Самыми ранними проявлениями игрового поведения являются игры детеныша с матерью. Игры между самцами и детенышами относительно редки, но также встречаются, особенно в неволе. Наши данные подтвердили наблюдения Диан Фосси и теорию Бекоффа, что детеныш, вырастающий в группе, где у него нет возможности играть с другими сверстниками, развивается медленнее, чем детеныши, которые имеют достаточно возможностей играть с другими детенышами.

В Пражском зоопарке мы изучали игровое поведение в группе 8 горилл – 1 половозрелый самец, 4 половозрелые самки и 3 детеныша – 1 самка и два самца. Типы игр были разделены на 4 категории: Игра индивидуальная или социальная; Игра с предметом или без предмета; Игра кратковременная или долговременная; Игра законченная или переходящая в другой тип игры.

Анализ игрового поведения в группе горилл подтвердил гипотезу, что у горилл значительно преобладает индивидуальный тип игры. Взрослые животные не инициировали социальных игр. В большинстве случаев они играли в одиночку. В случае совместных игр их вызывали к игре детеныши. Гориллы чаще играли без предмета, чем с предметом, но у детенышей манипуляционные игры встречались чаще,

чем у взрослых животных. Интенсивность игр была выше у детенышей, но с возрастом она уменьшалась. Партнером в играх у детенышей чаще бывали другие детеныши, чем взрослые животные. Также мы наблюдали, что участие в совместных играх принимают максимально двое животных, но не более. Инициатором игры со взрослым самцом всегда был детеныш. При этом самец всегда толерантно относится к

детенышу, с которым он играет. Интенсивность и частота игрового поведения у горилл начинает уменьшаться в возрасте 6 лет.

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К ИСТОРИИ КОГНИТИВНОЙ НАУКИ В РОССИИ: КОНЦЕПЦИЯ Л. В. КРУШИНСКОГО О БИОЛОГИЧЕСКИХ ОСНОВАХ РАССУДОЧНОЙ ДЕЯТЕЛЬНОСТИ

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В 2011 г. исполнилось 100 лет со дня рождения Л. В. Крушинского (1911–1984), который был (и остается) одним из крупнейших специалистов в области изучения поведения животных. На протяжении своей долгой жизни в науке он обращался ко многим, зачастую далеким друг от друга областям биологии – феногенетике, физиологии высшей нервной деятельности, патофизиологии, генетике поведения, этологии. Однако наибольшую известность принесли Леониду Викторовичу его исследования проблемы мышления или, по его терминологии, рассудочной деятельности животных. Выполненные им фундаментальные исследования этой проблемы и посвященные ей монографии не устарели и представляют несомненный интерес для современной когнитивной науки.

Леонид Викторович обратился к проблеме мышления животных в середине 1950-х гг., когда подобными вопросами почти никто не занимался. Следует напомнить, что это был период в развитии отечественной науки, когда преследовалось любое отступление от канонизированного варианта условно-рефлекторной теории, когда новаторские работы самого И. П. Павлова в области изучения мышления замалчивались, а классик отечественной зоопсихологии Н. Н. Ладыгина-Котс испытывала большие трудности с публикацией работ, посвященных мышлению животных как биологической предпосылке мышления человека. Что касается когнитивных процессов у животных, то это понятие отвергалось как антинаучное.

Обращение Леонида Викторовича к изучению мышления животных было вызвано не только общим интересом к проблемам

эволюции поведения, но и глубоким знанием поведения животных в природе. Наличие несомненного таланта наблюдателя и стремление к глубокому анализу увиденного сделали Леонида Викторовича незаурядным натуралистом, способным многое заметить и при кратковременных встречах с дикими зверями (включая волков и медведей), и при повседневном общении с обычными домашними животными. Скрупулезный анализ наблюдений привел его к заключению, что во многих случаях поведение зверя не может быть только проявлением инстинкта или результатом долгого обучения. Он предположил, а затем доказал в лабораторных экспериментах, что элементы мышления, или, как он их называл, рассудочной деятельности, позволяют животному экстренно находить оптимальное решение в ряде непредвиденных ситуаций. Именно описание этих наблюдений, собранных на протяжении всей жизни, привело Леонида Викторовича к экспериментальному изучению разума животных с помощью разработанных им оригинальных методик (задача на экстраполяцию направления движения пищевого раздражителя, исчезающего из поля зрения, задача на оперирование эмпирической размерностью фигур, задача Ревеша-Крушинского). Прообразом этих задач послужили некоторые ситуации, с которыми животное может сталкиваться в естественной среде обитания. Они отражают присущие среде физические закономерности («эмпирические законы» по Л. В. Крушинскому или представления о постоянстве свойств предметов – «object permanence» по Ж. Пиаже) и структура их такова, что они могут быть решены при первом же предъявлении.

Важнейшая особенность экспериментального подхода Л. В. Крушинского состояла в том, что, в отличие от орудийных задач В. Келера, в которых животное должно было добывать

видимую, но физически недоступную приманку, в разработанных им задачах приманка исчезает из поля зрения животного, так что анализ ситуации и принятие решения происходит за счет оперирования мысленным представлением об исчезнувшей приманке. Благодаря этому арсенал изучения когнитивных способностей обогатился универсальными тестами, которые можно было предъявлять животным самых разных видов.

На основе применения этих методик за сравнительно короткое время была получена сравнительная характеристика когнитивных способностей позвоночных 5 классов (более 20 видов), было установлено, что зачатки мышления существуют не только у антропоидов, но и у ряда видов рептилий, птиц и млекопитающих, тогда как у рыб и амфибий их обнаружить не удалось. Впервые было продемонстрировано, что в пределах классов птиц и млекопитающих существует ряд параллельных градаций по степени развития рассудочной деятельности, которые коррелируют с уровнем морфофизиологической организации мозга. Дальнейшие исследования Л. В. Крушинского позволили анализировать природу этой формы высшей нервной деятельности. Ему удалось показать, что:

1. способность к обучению и к решению элементарных логических задач имеют разный морфофизиологический субстрат;
2. способность к их решению появляется на существенно более поздних этапах онтогенеза, чем способность к обучению;
3. уровень развития рассудочной деятельности животных в пределах одного вида генетически детерминирован;
4. уровень развития рассудочной деятельности вида определяется степенью развития мозга, тогда как его экологические особенности могут

оказывать лишь ограниченное влияние в пределах этого уровня;

5. несмотря на принципиальные различия в структуре мозга птиц и млекопитающих высшие представители класса птиц достигают уровня хищных;

На основе этих фактов Л. В. Крушинский (1974; 1977) создал концепцию физиолого-генетических основ этой сложнейшей формы поведения и психики животных, которая не только не потеряла своего значения, но получила развитие в работах его лаборатории (см. например, Зорина, Обозова, 2011; Зорина, Смирнова, 2011; Плескачева, 2008; Перепелкина и др., 2006 и мн. др.) и подтверждение в многочисленных исследованиях за рубежом (см. например, Emery, Clayton, 2005 Hurley, Nudds (eds.), 2006).

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ОСОБЕННОСТИ ФИЗИОЛОГО-ГЕНЕТИЧЕСКОГО КОНТРОЛЯ СПОСОБНОСТИ ЛАБОРАТОРНЫХ МЫШЕЙ К РЕШЕНИЮ ЭЛЕМЕНТАРНОЙ ЛОГИЧЕСКОЙ ЗАДАЧИ

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Существование генетической компоненты изменчивости когнитивных способностей животных было известно с первых десятилетий XX века. Наиболее известны существующие и по сей день 2 линии – «умных» и «тупых» крыс,

выведенных в 1920-е годы в Р. Трайном. Они совершали, соответственно, много или мало ошибок при поиске пищи в сложном лабиринте. Успешную селекцию лабораторных грызунов (мышей и крыс) на высокий и низкий уровни обучаемости проводили затем неоднократно, причем на основе как пищевой, так и оборонительной мотивации. Относительная быстрота ответа на селекцию в этих опытах не вызывала сомнений, во-первых, в существовании генетической

компоненты этой способности, во-вторых, в том, что в ее определении участвует небольшое число генов, а в-третьих, в возможности быстрой идентификации нейрохимических механизмов пластичности ЦНС и способности к обучению (как ее наиболее реальному проявлению). Как мы знаем, история нейробиологии последних десятилетий не подтвердила подобный оптимизм, хотя успехи молекулярно-биологического подхода к этой проблеме достаточно известны и весьма высоки.

В то же время в применении к животным понятие «когнитивное поведение» не исчерпывается феноменом научения. Этот термин относится прежде всего к тем формам поведения, которые основаны на оперировании внутренними представлениями (психическими образами, психо-нервными представлениями). Этот механизм лежит, в частности, в основе пространственного поведения (*spatial cognition*), которое тестируют в экспериментах с помощью разных типов радиальных и водных лабиринтов Морриса), а также к проявлениям мышления или элементарной рассудочной деятельности (Крушинский, 2009). Работами Л. В. Крушинского и его коллег на многих видах животных было показано, что животные могут при первом же предъявлении решать такие задачи, которые требуют от них способности оперировать представлениями о постоянстве свойств предметов («object permanence»), или, по терминологии Л. В. Крушинского (2009), «эмпирическими законами, связывающими предметы и явления окружающего мира».

Накопление данных по способности животных к элементарной рассудочной деятельности выявило феномен высокой изменчивости этой способности в пределах одного вида, что, в свою очередь, послужило основанием для проведения селекционного эксперимента. Исходной популяцией были гибриды F2 от скрещивания диких крыс пасюков (с высокой долей правильных решений теста на экстраполяцию направления движения пищевого стимула после его исчезновения из поля зрения животного) и крыс лабораторной линии КМ. Однако этот селекционный эксперимент закончился неудачей из-за высокого уровня тревожности (пугливости) крыс – потомков селекционных скрещиваний. Резко выраженная реакция страха в экспериментальной камере не давала возможности оценить уровень способности к экстраполяции этих животных. В то же время факт наличия этой способности у диких крыс (в отличие от крыс лабораторных линий) сомнения не вызывал (Крушинский и др., 1975). Было также показано,

что мыши-носители робертсоновской трансформации (слияния) хромосом 8 и 17 обладали способностью к решению теста на экстраполяцию, в отличие от контроля – мышей с нормальным кариотипом, но имеющих тот же генетический фон (Салимов и др., 1995).

В дальнейшем были проведены три успешных эксперимента по селекции лабораторных мышей (из гетерогенной популяции от скрещивания 6 инбредных линий) на большой и малый относительный вес мозга. В них были получены линии, с достоверными различиями веса мозга (до 20% среднего веса мозга). Было показано, что мыши с большим весом мозга обладают более высокой способностью к обучению, более высокую исследовательскую активность в новой среде, а также в целом обнаруживают более высокую способность к экстраполяции направления движения стимула. Мыши с малым весом мозга обнаруживают тревожное поведение и склонность к стереотипному поведению (см. Перепелкина и др., 2006). На основе гетерогенной популяции мышей, полученной от скрещивания этих линий, был начат новый селекционный эксперимент. При его проведении отбирают мышей, которые не только практически безошибочно решают задачу на экстраполяцию, но и не обнаруживают в процессе решения этого теста признаков страха и тревоги – не отказываются от выполнения теста ни в начале его (отказы), ни в ходе его предъявления (нулевые решения). Показатели тестирования поведения этой линии (ЭКС) сравнивают с таковыми неселектированных потомков исходной популяции (КоЭКС). В результате такой селекции, начиная с 4-го ее поколения, обнаруживается четко выраженный более низкий уровень тревожности у мышей ЭКС, что было подтверждено в тестах «открытое поле» и приподнятый крестообразный лабиринт». В тесте на способность к экстраполяции мыши ЭКС также были менее тревожны. Иными словами, был обнаружен четкий ответ на селекцию против проявлений тревожности. В то же время достоверного изменения доли правильных решений задачи на экстраполяцию к 7-му поколению селекции на высокие показатели этого признака не произошло. Однако число контактов с новым предметом, помещенным на арену «открытого поля» (т.е. исследовательское поведение), было достоверно выше именно у мышей селектированной линии ЭКС. Данные по первым поколениям селекции мышей на данный когнитивный признак могут означать, что наследование способности к решению этой элементарной логической задачи определяется очень сложной системой, а отсутствие к 7-му

поколению ответа на селекцию по этому признаку еще не означает невозможности обнаружить их при дальнейшей селекции. Следует вспомнить, что слабый ответ на селекцию по признакам поведения может быть выявлен в случаях с высокой неаддитивной компонентой наследуемости, что, в свою очередь, может говорить о важности исследуемого признака в формировании приспособленности. Разумеется, эти соображения являются лишь предварительными, однако трудность подобной селекции может быть причиной того, что способность к формированию пространственных представлений у лабораторных грызунов, которая была объектом исследования в сотнях работ, ни разу не была исследована методом селекционного эксперимента.

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ИССЛЕДОВАНИЕ СПОСОБНОСТИ ПТИЦ УСТАНОВЛИВАТЬ СИММЕТРИЧНОСТЬ ЭКВИВАЛЕНТНЫХ ОТНОШЕНИЙ

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Источником данных для реконструкции происхождения мышления и языка человека может служить изучение высших когнитивных функций животных. Особого интереса в этом контексте заслуживают животные с высокоорганизованным мозгом, причем не только антропоиды, но и представители других ветвей эволюции. Среди птиц – это врановые и попугаи (Emery, Clayton, 2005). Данные об их когнитивных способностях постепенно накапливаются (Lazareva et al., 2004; Pepperberg, 2006; Huber, Gajdon, 2006; Зорина, Смирнова, 2008 и др.), хотя все еще остаются немногочисленными по сравнению с результатами, полученными на голубях, которые хотя и принадлежат к филогенетически древней группе птиц с примитивным строением мозга, продолжают оставаться основным объектом исследований в сравнительной психологии.

Для реконструкции происхождения мышления и языка человека важен вопрос о том, в какой степени животные могут формировать понятия и усваивать знаки для их обозначения. Ирен Пепперберг в ходе многолетних исследований когнитивных способностей серых жако продемонстрировала, что способности этих попугаев к обобщению, абстрагированию, формированию понятий и символизации сопоставимы с таковыми у антропоидов (Pepperberg, 1999, 2006, 2006a, 2007). Нами ранее было показано, что другие

высокоорганизованные представители класса птиц – серые вороны способны оперировать понятиями о числе, а также о сходстве и различии (Smirnova et al., 2000; Зорина, Смирнова, 2008). Кроме того, эти птицы способны установить тождество между обобщенной информацией о числе элементов в множествах разной природы (понятием о числе) и исходно индифферентными для них знаками (изображениями арабских цифр от 1 до 8); а также оперировать усвоенными знаками – выполнять с цифрами комбинаторную операцию, аналогичную арифметическому сложению (Смирнова, 2002; Смирнова, 2011). В целом эти данные демонстрируют, что высокоорганизованные птицы способны устанавливать эквивалентность понятий и знаков. Причем птицы успешно использовали все три свойства эквивалентных отношений: рефлексивность ($A=A$; $B=B$); симметричность (если $A=B$, то $B=A$) и транзитивность (если $A=B$, и $B=C$, то $A=C$).

Другой аспект этой проблемы – изучение механизмов формирования эквивалентности, и, в частности – симметричности эквивалентных отношений. Могут ли животные продемонстрировать спонтанное понимание симметричности таких отношений: т.е. спонтанно выбирать «А» в ответ на «В», после того, как были обучены выбирать «В» в ответ на «А»? Многократно показано, что испытуемые-люди успешно демонстрируют спонтанное понимание симметричности (например, Sidman, Tailby, 1982). Вероятно, во многом это обусловлено тем, что весь опыт

обучения языку и использования языка основан на применении симметричности таких отношений. Данные о способности животных спонтанно понимать симметричность эквивалентных отношений крайне противоречивы (Lionello-DeNolf, 2009). В большинстве исследований животные с подобным тестом не справляются, тогда как в некоторых других все же демонстрируют спонтанное понимание симметричности отношений (Kastak et al., 2001; Yamamoto, Asano, 1995; Tomonaga et al., 1991; Frank, Wasserman, 2005). Подобная неоднородность результатов, вероятно, обусловлена не только уровнем развития мозга, но и различиями в предыдущем экспериментальном опыте животных, в деталях используемых экспериментальных процедур и, таким образом, в том, чему животное реально обучается в ходе конкретного эксперимента (Lionello-DeNolf, 2009).

Для уточнения этих неоднородных данных мы предъявили тест на спонтанное понимание симметричности эквивалентных отношений серой вороне и венесуэльскому амазону. Перед этим их обучили выбирать стимулы с изображением двух одинаковых элементов в ответ на изображение одного знака и стимулы с изображением двух разных элементов в ответ на изображение другого знака.

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ПРОБЛЕМА ПРОИСХОЖДЕНИЯ ПСИХИКИ

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Анализ различных биологических эволюционных концепций показывает, что в филогенетическом контексте психику следует рассматривать в качестве одного из факторов биологической эволюции живых систем; она ориентирует и направляет ход этого процесса. Подобная ориентировочная функция обозначена в ряде современных эволюционных концепций (эпигенетическая теория эволюции, концепция естественного эволюционного упорядочения),

хотя непосредственно о психике речи не ведется. Кроме того, данный тезис согласовывается с идеями В. А. Вагнера и А. Н. Северцова.

Одной из первых задач, встающих перед психологом-исследователем, разрабатывающим проблему места и роли психического в эволюционном процессе, является решение вопроса о «точке отсчета» — моменте возникновения психики в процессе развития всего мира в целом. В частности, к этому же проблемному полю принадлежит вопрос о происхождении когнитивного компонента психического отражения.

На настоящий момент в философии и науке существует множество альтернативных концепций, объясняющих процесс генезиса психики

определяющих момент ее возникновения. Их можно классифицировать на несколько общих групп:

1) Панпсихизм – всеобщее одушевление материи; позиция, согласно которой психика наличествует у любого объекта в природе (Сократ, Платон, Спиноза, Гегель, Г.Т. Фехнер и Ж.Б. Робин). Ключевым недостатком данных концепций является возведение частного до всеобщего: психика, как форма отражения и информационного упорядочения материальных процессов определенного уровня развития, распространяется на все виды взаимодействий, находящихся в материальном мире.

2) Биопсихизм акцентирует внимание на качественном отличии живой и неживой материи, утверждая, что психика имеется у всех живых систем (И. Гоббс, Э. Геккель, В. Вундт, Я.А. Пономарев, П.К. Анохин). На современном этапе развития науки данный подход представляется весьма перспективным, однако в большинстве биопсихических концепций отсутствует разрешение ряда принципиальных проблем, связанных с принятием данной точки зрения. Во-первых, не решается проблема отличительных особенностей психического и физиологического, что имплицитно сводит психический уровень организации к биологическому. Кроме того, зачастую исследователи, постулируя наличие психики у всех живых систем, не осуществляют анализа процесса и закономерностей развития психических феноменов в ходе эволюции, как и анализа специфических уровней и форм психической организации при условии, что в рамках принимаемой точки зрения такая организация наличествует у чрезвычайно разнообразных групп живых существ.

3) Анималопсихизм – наиболее разработанный и широко принимаемый подход, приписывающий психические феномены не всему живому, а лишь определенному царству живых организмов – животным (Г. Спенсер, И. М. Сеченов, А. Н. Северцов и Н. Н. Ладыгина-Котс). Невзирая на, казалось бы, очевидную обоснованность анималопсихизма, многие исследователи принимают его аргументацию имплицитно, не ставя вопрос об объективном критерии психического. Кроме того, при принятии данной точки зрения весьма остро встает вопрос об отличительных особенностях царства животных (metazoa), как обладателей психической формы регуляции жизнедеятельности, учитывая также то обстоятельство, что многие протисты (protozoa), включая тех, что по своей организации оказываются ближе к растениям

или грибам, также демонстрируют проявления психических феноменов.

4) Нейропсихизм. Согласно ему, психика, являясь атрибутом нервной системы, наличествует лишь у тех животных, у которых таковая имеется (В.А. Вагнер, В.Б. Швырков). Слабой стороной нейропсихизма в целом является прежде всего то, что в нем нарушается один из фундаментальных принципов филогенетического развития – принцип ведущей роли функции по отношению к органу, согласно которому сначала возникает специфическая функция (в данном случае – психика), позже организующая под себя соответствующий орган – нервную систему.

5) Антропоспсихизм признает наличие психики только у человека (Аристотель, Р. Декарт). Недостатком данного подхода является возведение частного (сознания, как высшей формы психического отражения, присущей человеку) до общего – психики в целом.

6) В качестве отдельной группы следует выделить теорию А.Н. Леонтьева и основанные на ней более современные концепции. В качестве объективного критерия психического А.Н. Леонтьев предлагает чувствительность – способность живой системы реагировать и ориентироваться на такие воздействия и факторы внешней среды, которые непосредственно не используются ею в целях конструктивного и энергетического метаболизма, но при этом относят живую систему с такими факторами, выполняя сигнальную функцию. На основе данного критерия Леонтьев приписывал психику животным и некоторым протистам. Однако современные научные данные показывают, что способность к чувствительности наличествует у многих представителей других царств живой природы: бактерий, грибов, растений. Между тем весь инструментарий данной концепции рассчитан именно на описание психических феноменов животных и протист, но оказывается непригоден для изучения психики у представителей других царств, учитывая, что по большинству параметров своей жизнедеятельности эти живые системы существенно качественно отличаются от организмов тех групп, на которые была рассчитана периодизация Леонтьева.

Проведенный нами аналитический обзор эволюционных, биогенетических и психологических концепций показывает, что ни одна из них не содержит исчерпывающего ответа на вопрос о генезисе и эволюции психики. Однако мы можем сформулировать ряд ключевых тезисов, учет которых имеет принципиальное значение для решения этой проблемы на современном этапе развития науки:

- Анализировать процесс генезиса и эволюции психики следует исходя из принципа единства живой системы, среды ее обитания и особенностей взаимодействия с данной средой, что, в частности, вытекает из концепции генезиса психики А.Н. Леонтьева. Иначе говоря, филогенез психики носит коэволюционный характер;

- Специфические свойства психического уровня организации начинают складываться еще до его непосредственного формирования, проявляясь в том числе и в неживой природе, как пример, направленность («интенциональность» по Д. Деннету) материальных процессов;

- Следует допустить существование психики (или ее аналогов) у всех живых организмов;

- Для решения вопроса о генезисе психики, а также для выделения форм и уровней ее организации необходимо выработать систему из нескольких критериев, позволяющую комплексно оценивать специфику взаимосвязи той или иной живой системы с окружающей ее средой;

- При проведении периодизации развития психики необходимо учитывать несовпадение уровней психической и морфофизиологической организации живых систем.

РОЛЬ БИОГЕННЫХ АМИНОВ В ПРОЯВЛЕНИЯХ АГРЕССИИ И ОБУЧЕНИЯ У НАСЕКОМЫХ

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Когнитивные аспекты поведения насекомых привлекли внимание исследователей лишь с недавнего времени, когда обнаружилось, что, несмотря на различные физиологические механизмы, лежащие в основе тех или иных форм поведения, некоторые виды насекомых способны решать когнитивные задачи на уровне высших позвоночных, и поведенческие модели, исследованные на насекомых, могут служить основой для плодотворных аналогий (Reznikova, 2007). В данной работе предлагается новая поведенческая схема для исследования роли биогенных аминов в проявлении агрессивного поведения и когнитивной деятельности в естественной ситуации межвидовой территориальной конкуренции насекомых. Ранее было показано, что в основе топической конкуренции рыжих лесных муравьев и хищных жужелиц лежат поведенческие механизмы, основанные на процессах распознавания образов, обучения и запоминания (Дорошева, Резникова, 2006).

Биогенные амины (БА) насекомых (дофамин, серотонин, октопамин и тирамин) выполняют многофункциональную роль, выступая в качестве нейротрансмиттеров, гормонов и модуляторов многих нейронных и физиологических процессов. Существенную роль БА играют в регуляции когнитивной деятельности насекомых: ольфакторном обучении, запоминании, а

также в функциональной организации семьи у общественных насекомых.

В современных нейробиологических исследованиях применяется целый ряд методов, позволяющих выявить роль БА в регуляции поведения и молекулярные механизмы реализации этого процесса. В частности, способность нейровеществ, в том числе БА, активировать или ингибировать поведенческие реакции изучают в фармакологических опытах, наблюдая за изменением поведения особей после введения им веществ. Используется три пути введения препаратов насекомым: инъекция, аппликация и скармливание. Большинство нейробиологических исследований БА у насекомых проведено на модельных видах: дрозофила, медоносная пчела, сверчки, тараканы, шмели. Представители других систематических групп изучены мало, а когнитивные аспекты поведения насекомых практически не исследуются. Агрессивное поведение насекомых до сих пор изучалось нейробиологами в ситуациях, требующих “автоматизированной” реакции в ответ на действие триггера. Мы предлагаем поведенческую модель, основанную на недавно описанной форме когнитивного поведения насекомых, названной нами “обучение из каталога” и проявляющейся в ситуации межвидовой территориальной конкуренции рыжих лесных муравьев и хищных жужелиц (Дорошева, Резникова, 2011): в ответ на повторяющиеся столкновения с муравьями жуки обучаются выбирать оптимальный для ситуации стереотип поведения из своего поведенческого репертуара. Память о приобретённых навыках сохраняется у жужелиц в течение нескольких

дней. В двустороннем взаимодействии у муравьев степень агрессивности по отношению к конкуренту увеличивается с возрастом рабочих особей и различается у представителей разных специальностей: охранники и охотники нападают на жуков чаще, чем сборщики пади тлей (Яковлев, 2010).

Мы исследуем функции БА в двустороннем проявлении территориальной межвидовой конкуренции насекомых, уделяя основное внимание проявлению агрессии у муравьев и процессу обучения и запоминания у жуков. В сериях лабораторных поведенческих экспериментов с применением фармакологических техник изучали способность октопамина изменять (1) уровень активности и агрессивность муравьев и (2) уровень подвижности жуков, их поведенческие тактики взаимодействия с муравьями, а также выживаемость жуков после столкновения с конкурентами. В первой серии опытов агрессивность муравьев определяли, ссаживая их по одному с жужелицами *Pterostichus magus* и подсчитывая частоту нападения муравьев на жуков. Выявлено, что скармливание октопамина (5 мг/мл в 50% растворе сахарного сиропа) группе муравьев (100 особей) в течение 2 недель вызывало постепенное увеличение уровня агрессивности по отношению к конкурентам, по сравнению с контрольной группой муравьев. Это изменение тем более значимо, что уровень двигательной активности муравьев оставался сходным в обеих группах. Во второй серии экспериментов исследовали индивидуальное поведение жуков *P. magus* при столкновении с группой из трех муравьев на арене (15x15 см) в течение 10 мин. За час до проведения тестов жукам делали инъекции (3 мкл). Экспериментальной группе (11 особей) вводили октопамин (133 мг/мл в физрастворе), а контрольной группе (8 особей) – физраствор. В тесте открытого поля уровень подвижности жуков, инъецированных октопамином, ниже, чем в контрольной группе. При взаимодействии с муравьями жуки обеих групп демонстрировали сходные

наборы поведенческих паттернов. Интересно отметить, что при одинаковой продолжительности атак муравьев на жуков выживаемость опытной группы, в течение недели, оказалась существенно выше, чем контрольной: 82% и 9% (различия значимы согласно угловому преобразованию Фишера, $\phi^*_{\text{эмп}} = 3.31$, $p < 0.001$). Если жуки не погибают непосредственно во время столкновения с муравьями или сразу после, гибель их связана, главным образом, с проникновением грибковых и бактериальных инфекций через нарушенные покровы (Kölbe, 1969). Можно предположить, что повышение уровня октопамина у жуков приводит к активизации иммунитета, что снижает смертность от инфекций. Увеличение выживаемости жуков с повышенным уровнем октопамина после агрессивного столкновения с конкурентами может способствовать приобретению опыта и последующей оптимизации тактик взаимодействия. Проверка этой гипотезы требует отдельных экспериментов.

В целом, можно полагать, что биогенные амины играют существенную роль в актуальных процессах обучения и проявления агрессии у видов насекомых с достаточно высоким когнитивным потенциалом, что делает предложенную модель актуальной для сравнительных когнитивных исследований.

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INTELLIGENCE AND BIOSPHERE

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During the last decades the development of cognitive ethology has offered hints that some non-human species surpass our species in many narrow cognitive domains. Extraordinary abilities of rats for spatial orientation, uncanny abilities of pigeons for classification and discrimination of 3D objects, phenomenal memory of food-caching animals, can serve as good examples here (see review in: Reznikova, 2007).

Until recently, these data remained within the frame of the concept of “species genius” and have not dramatically changed our knowledge about uniqueness of human intelligence. Ape-language researchers have succeeded to enter into a direct dialog with non-human beings and revealed the common mental features of non-humans with our species, such as abilities to combine words for naming new things and concepts, to categorize, to generalize the experience, to judge about remote events and so on (see review in: Savage-Rumbaugh, Lewin, 1994). However, although many impressive results concerning sophisticated mental skills in animals have been obtained, our knowledge is restricted by the use of artificial communicative systems elaborated specifically for communication with animals, and mental characteristics of wild communications remain so far obscure. Natural “languages” of animals, such as honey bees, dolphins and monkeys, are understandable only within narrow limits. At the same time, even bits of natural communications which were lent to “translation” indicated rather complex forms of communication in animals. For example, dolphins appeared to be using arbitrary signals to identify each other, that is, to recognize names (Sayigh et al., 2007). Apparently, only first steps in the study of non-human “languages” and intelligence have been made, and we are still lacking adequate methods for assessing natural communications closely related with cognitive abilities.

The use of the principally divergent approach based on ideas of Information Theory (Reznikova, Ryabko, 2011; Ryabko, Reznikova, 2009) enabled us to reveal a developed natural communication system in several highly social ant species. The basic properties of ant “language” and related cognitive

skills are characterized by traits which have been considered before unique to human, and among them are the following: direct proportionality between quantity of information to be passed and the length of the message, the ability to grasp regularities, to use them for coding and “compression” of information, as well as the ability to count and to add and subtract small numbers to optimize messages. As far as we know, these are the first attempts to apply an integrative method for studying both natural communications and cognitive abilities of animals. Apart from these studies, recently new data have been obtained concerning certain cognitive abilities in animals, which changed our understanding about limits of mental skills in non-humans. For example the club of counting animals currently involves not only ants (see papers cited above), birds (Smirnova et al., 2000), elephants (Irie – Sugimoto et al., 2009), and, of course, primates (see detailed review in: Reznikova & Ryabko, 2011) but also such “simple” organisms as fish (Agrillo et al., 2008) and beetles (Carazo et al., 2009).

In sum, we can suggest that cognitive capacities of many non-human species exceed the bounds of specific cognitive adaptations. This should change the way we think about distribution of intelligence in biosphere. Many discoveries are in store for cognitive ethologists in this field. One of the topical problems of cognitive science concerns the development of methods for comparative analysis of “biodiversity” of mental and “linguistic” skills in non-human and human species.

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Воркшоп «Когнитивное компьютерное моделирование» / Workshop “Cognitive computer modeling”

Ведущие: Геннадий Семенович Осипов,
Александр Игоревич Панов
Chairs: Gennady S. Osipov, Alexandr I. Panov

NATURAL OBJECT RECOGNITION WITH A VIEW-INVARIANT NEURAL NETWORK

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1. Introduction

In primate cortex, the visual information is processed in two major parallel pathways: ventral and dorsal processing streams (Goodale and Milner, 1992). The ventral pathway is considered to be responsible for discrimination and recognition of visual images of objects. The recognition of color, shape and texture of objects is processed in this pathway. In primate cortex, it is presented by the number of areas, crucial for visual perception and recognition of objects: V1, V2, V4, and IT. These areas are organized in a retinotopic manner, but with different degrees of resolution (Fujita, 2002). The indispensable role of the ventral pathway for object vision has been supported by findings of selective cell responses to complex object features and of the columnar organization in anterior IT (Tanaka, 2003).

2. Materials and methods

The architecture of our model is based on the notion of the self-organized map (SOM), proposed by Kohonen (Kohonen, 2001). The conventional SOM has a number of restrictions: the main one is its ability to deal only with the vectorized data. Tokunaga and Furukawa (Tokunaga and Furukawa, 2009) have proposed a significant variation of the conventional SOM, called the modular network SOM (mnSOM): each vector unit of the conventional SOM is replaced by a functional module. These modules are arrayed on a lattice that represents the coordinates of the feature map. Authors regard the case of a multi-layer perceptron (MLP) module as the most commonly used type of neural network. In this research, we intended to use the SOM of functional modules, as it resembles the functional organization of the cortex. However, for the purposes of this study, RBF network modules were used. The use of RBFs instead of the MLPs adds the additional abilities to such a network: the ability to recognize the object and store its representation in its inner

center; the use of the SOM of RBFs architecture is more neurophysiologically plausible (Logothetis et al., 1994, Poggio and Edelman, 1990). The generalized algorithm for processing the SOM of functional models can also be applied in this case. However, this architecture is capable only of recognition of simple transparent objects (Efremova et al., 2011). In order to investigate the ability to classify complex 3D objects, we extend our SOM of RBFs model by adding a preprocessing module. The first level of this module consists of local orientation detectors that model simple cells in the primary visual cortex (V1). These detectors are Gabor-like filters of four preferred orientations, which are reported to be similar to the receptive fields of mammalian cortex. The sizes of the receptive fields (RFs) of these detectors correspond to the RFs of monkey V1 (Riesenhuber and Poggio, 1999). The next level contains position-invariant bar detectors, which correspond to complex-like cells in area V1, or to neurons in areas V2 and V4. The combination of the features, extracted at earlier stages in the ventral pathway, is then processed with the neurons of IT cortex. On the resulting map each region depicts one of the stimuli, presented to the network, and thus the network output forms a classification of the input objects according to their shape.

3. Simulation analysis and results

The proposed architecture is intended to classify natural objects and to create a similarity map of these objects in a neurophysiologically plausible manner. The simulation experiments involved four computer-generated 3D objects. The inputs of the network were individual views of each object rotated in depth in ten-degree steps. The output of the network formed a similarity map of the input

objects (Fig.1). We found that the majority of SOM-units exhibit tuning to a particular object. The view that causes the best response in the RBF module is depicted on the corresponding lattice square. On the resulting similarity map different objects are represented in different regions of the output map. This demonstrates that the network can classify the input objects and form a similarity map based on their shape. At the RBF-level, the network stores the inner representations of the input objects in its centers, which are activated during the presentation of the learned object to the network. The activation graph usually has one peak for a specific view of the object, and the activation level declines smoothly during the rotation of the object in-depth. In some cases the activation graph has two peaks: the second peak shows the activation of the hidden unit for the presentation of the mirror-view counterpart of the preferable view. We can conclude that the presented architecture is capable of classification of the set of 3D objects in the neurophysiologically plausible way.

4. Discussion

We described the properties of the proposed cortical architecture for hierarchical visual perceptual processing, composed of modules resembling the ventral visual stream of the primate cortex. We showed that by introducing this architecture, our model is capable of performing recognition and classification of complex 3D objects and creating a similarity map of these objects. The behavior of the proposed network is consistent with the corresponding properties of monkey IT cortex (Logothetis et al., 1994). In addition, our previous study has shown that the method of storage of information in the SOM of RBFs is similar to the organizational map of the IT region: the inner representations of the input objects in the RBF

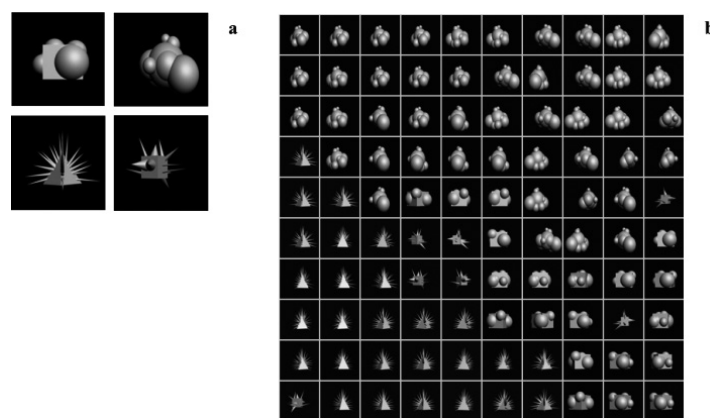


Fig.1: (a) The stimuli set: four 3D objects. (b) Similarity map. Each neuron of ten by ten SOM units depicts the object view, which cause the best response in the RBF module.

centers resemble the columnar organization of the IT cortex (Efremova et al., 2011). Furthermore, the organization of the similarity map generated by the current model can be compared with the pattern of horizontal activation of the IT area, as was described by Tanaka (Tanaka, 2003).

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МЕХАНИЗМЫ СТРУКТУРИРОВАНИЯ ИНФОРМАЦИИ В АССОЦИАТИВНОЙ МОДЕЛИ ПАМЯТИ

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Ассоциативная память

Работа посвящена созданию модели памяти, обладающей свойством ассоциативности. Применительно к человеческой памяти ассоциативность означает, что мысль о некотором предмете способна породить длинную цепочку воспоминаний, связанных с начальным предметом не только семантически, но некоторыми ассоциациями. «Вспоминать – значит иметь воспоминание или приступить к поиску воспоминания» (П. Рикёр, 2004). Согласно Аристотелю, поиск воспоминания возможен только по некоторой цепочке, начало которой доступно нам в настоящий момент времени, а в конце ее находится нужное воспоминание. Таким образом, чтобы вспомнить нечто, необходимо либо иметь непосредственный доступ к нужной информации либо знать, из какого места эта информация достижима.

Понятие ассоциативной памяти в информатике достаточно близко к ассоциативной памяти «в человеческом смысле». Однако ее компьютерное моделирование связано с рядом серьезных упрощений. В отличие от человеческой, компьютерная память является локально адресуемой. Компьютерное моделирование ассоциативной памяти связано, в первую очередь, с преодолением необходимости обращения к данным по их физическому адресу. Чаще всего в компьютерном моделировании в широком смысле под ассоциативной памятью понимается память, в которой поиск информации производится по ее содержанию. Она называется памятью, адресуемой по содержанию.

Математические модели долговременной памяти имитируют некоторые процессы, происходящие в естественной памяти. В модели долговременной памяти (модель памяти со случайной выборкой), предложенной В.Л. Стефанюком (2004, 2011), повышение скорости поиска по образцу происходит за счет дублирования информации и оптимизации количества копий, созданных для каждой сущности. Тем самым повышается вероятность извлечь из памяти сущности, поиск которых происходит чаще.

В настоящей работе предложена сетевая модель, позволяющая структурировать память таким образом, что поиск информации можно осуществлять, следуя по ассоциативным цепочкам, создающимся и изменяющимся автоматически на уровне топологии сети – в процессе поступления и обработки запросов. Причем часто используемая информация оказывается более доступной, и сила ассоциативных связей тем больше, чем чаще сущности упоминаются вместе. Такое хранение и поиск информации в памяти отчасти имитирует клеточные ансамбли Хебба (Hebb, 1959).

Ассоциативная ресурсная сеть

В работе Жиликова, 2009 описана модель памяти, названная *ассоциативной ресурсной сетью*. Эта модель представлена ориентированным графом с переменной топологией. Вершины соответствуют сущностям предметной области, ребра – ассоциативным связям между ними.

Каждая сущность обладает *яркостью*. Чем больше яркость вершины, тем она «виднее» – доступнее при поиске. Ребра обладают ограниченными пропускными способностями. Чем больше пропускная способность ребра между двумя вершинами, тем больше сила ассоциации между соответствующими сущностями.

Пропускная способность петли соответствует силе автоассоциации. Мы считаем, что отношение ассоциации симметрично, и тогда каждая пара смежных вершин связана двумя противоположно ориентированными ребрами.

В ассоциативной сети существует быстрое и медленное время. Одному такту медленного времени соответствует исполнение одного запроса. Каждый запрос выполняется в быстром времени, которое соответствует времени *ресурсной сети*.

Ресурсная сеть – динамическая потоковая модель, предложенная О.П. Кузнецовым (2009). Она представляет собой ориентированный граф с множеством вершин $V = \{v_i\}$. Вершины в каждый такт дискретного времени t обмениваются ресурсами, следуя заданным правилам. Вершина v_i в момент времени t содержит ресурс $q_i(t)$. Емкости вершин не ограничены. В сети выполняется закон сохранения: при ее функционировании ресурс не поступает извне и не расходуется. Ребра (v_i, v_j) имеют ограниченные (не обязательно одинаковые) способности проводить ресурс. Каждое ребро (v_i, v_j) имеет неотрицательную пропускную способность r_{ij} . Вершины могут иметь петли (v_i, v_i) с пропускной способностью, равной r_{ii} . Ресурс, попавший в петлю на такте t , вернется в нее на следующем такте.

Рассматриваются двусторонние сети, т.е. сети, в которых любые две смежные вершины связаны парой противоположно ориентированных ребер.

Ресурсная сеть является пороговой моделью: в каждый момент времени каждая вершина отдает ресурс во все исходящие ребра по одному из двух правил: если величина ресурса в ней больше суммарной выходной пропускной способности, она отдает по полной пропускной способности в каждое ребро, оставляя себе излишки; если ресурс в вершине меньше этой величины, он распределяется пропорционально пропускным способностям во все исходящие ребра.

Ассоциативная ресурсная сеть – это ресурсная сеть с переменной топологией. Вершины обозначают сущности предметной области,

ресурс соответствует яркости, пропускная способность петель отвечает за силу ассоциативной связи. Петли соответствуют автоассоциациям. Топология сети изменяется от запроса к запросу.

Запрос – это помещение ресурса в одну или несколько вершин сети. Ответ на запрос – распределение ресурса после его стабилизации. После выполнения запроса пропускные способности всех ребер, по которым тек ресурс, увеличиваются пропорционально суммарному пропущенному ресурсу. Если в начальном множестве запроса существуют несвязанные вершины, в сети создаются новые двусторонние пары, задающие новую ассоциацию.

Для того чтобы предотвратить неограниченный рост суммарной пропускной способности сети, вводится процедура нормировки. Указывается диапазон, в котором может варьироваться суммарная пропускная способность, и когда достигается верхняя граница, вся сеть нормируется к нижней границе диапазона. Эта процедура реализует естественное забывание: петли редко используемых в запросах вершин и редко проявляемые ассоциации «истончаются». Если вычислительные ресурсы позволяют, перенормировку сети желательно делать после каждого нового запроса.

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О ВОЗМОЖНОСТИ ОРГАНИЗАЦИИ ЗНАНИЙ НА ОСНОВЕ КОГНИТИВНОЙ СЕМАНТИКИ

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В последние десятилетия стало общепринятым понимание того, что процессы обработки информации в мозге человека устроены не так, как в компьютере. Если для исследователей мозга это означало явную недостаточность компьютерной парадигмы для объяснения мозговых процессов, то в искусственном интеллекте (ИИ) несходство компьютерных процессов с процессами мозга рассматривалось как возможность решать интеллектуальные задачи более эффективными методами, чем это делает мозг. Эта возможность действительно реализована во многих интеллектуальных технологиях. Однако до сих пор существуют интеллектуальные задачи, которые человек решает более эффективно, чем компьютер. Речь идет не только о творческих процессах, озарении и интуиции, которые в компьютере не моделируются вообще, но и о задачах, которые в ИИ моделируются. Человек не только быстро распознает; он еще быстро рассуждает и быстро принимает решения. Эти скорости сравнимы с компьютерными – при том, что скорость передачи сигналов в нервных сетях в миллион раз меньше электронной. Это означает, что с точки зрения вычислительной сложности некоторые процессы мозга в миллион раз эффективнее компьютерных.

Известен ряд попыток (или хотя бы проектов) построения нестандартных моделей мыслительных процессов (например, Sowa 1984, Hofstadter et al. 1994, Кузнецов 1995). Однако они либо локальны (т.е. способны объяснить только незначительную часть процессов мозга), либо неконструктивны, т.е. остаются на уровне нереализованных идей. Представляется, что существенно более всеобъемлющим является направление когнитивных наук, которое началось с исследований Э. Рош (Rosch 1975) и наиболее полно изложено в книге Лакоффа (Lakoff 1987). Нас будет интересовать не вопрос адекватности теорий этого направления реальным процессам человеческого мышления, а возможности использования этих теорий в интеллектуальных технологиях.

Концепция Лакоффа представляет собой проект решения двух проблем: проблемы категоризации и проблемы семантики.

Проблема категоризации, т.е. проблема формирования понятий у человека, состоит в

следующем. Традиционная формальная теория понятий рассматривает понятие как класс объектов, обладающих одинаковым набором признаков. Все объекты класса равноправны: любой объект класса в равной мере может служить его примером. Иерархия понятий строится от элементарных объектов к классам, которые в свою очередь являются объектами более общих классов и т.д. Считается, что элементарные объекты наиболее просты. Рош показала, что человеческая категоризация устроена не так. В категориях человека существуют «хорошие» (репрезентативные) и «плохие» примеры. Человеческие категории имеют внутреннюю структуру, которая для разных категорий различна. В человеческой иерархии понятий базовые понятия, которые когнитивно наиболее просты, находятся «в середине» иерархии общего-конкретного. Обобщение происходит вверх от базового уровня, специализация – вниз.

Когнитивная простота категорий базового уровня выражается в следующем:

- они имеют единый ментальный образ (гештальт); быстро узнаются;
- в качестве их имен используются наиболее короткие и общеупотребительные слова;
- большинство признаков членов категории хранится на этом уровне;
- формирование категорий у детей начинается с категорий базового уровня.

Возможные структуры категорий весьма разнообразны и не исчерпываются множествами элементов с одинаковым набором признаков. В книге Лакоффа развита довольно детальная (хотя не вполне формальная) типология категорий.

Предлагаемый Лакоффом проект когнитивной семантики отказывается от общепринятого формально-логического подхода, согласно которому независимо существуют синтаксис, модельные структуры и интерпретация, т.е. принципы отображения синтаксиса на модели. Формально-логический подход Гильберта – Тарского сыграл существенную роль в становлении компьютерной парадигмы, на которой основаны практически все достижения в области интеллектуальных систем (если не считать нейросетевых методов). Однако он не способен объяснить многие особенности человеческого мышления, которыми мозг отличается от компьютера.

Подход Лакоффа заключается в следующем. Термины, в которых мыслит человек, значимы с

самого начала. В отличие от компьютера, «люди не могут оперировать незначимыми символами». Значения возникают раньше, чем формируются концептуальные структуры: они возникают из доконцептуального телесного опыта. Доконцептуальные структуры – это гештальты и образно-схематические схемы: вместилище, верх-низ, часть-целое и т.д. Связанные с ними концепты непосредственно значимы. Предложение понимается непосредственно, если концепты, содержащиеся в нем, непосредственно значимы. Понимание – это способность соотносить концепты со своим опытом, включая доконцептуальный. Различия концептуальных систем в разных культурах проистекают в основном из различий в доконцептуальном опыте.

Концепции Лакоффа позволяют по-новому взглянуть на некоторые проблемы ИИ, и прежде всего на организацию знаний и моделирование рассуждений. Для организации знаний и, в частности, построения онтологий представляют существенный интерес идеи, связанные с категоризацией (на это обращено внимание в докладе Гавриловой и др. 2011). Что касается формализации рассуждений, то здесь важно иметь в виду следующее. Человек не рассуждает по законам формальной логики. Такие рассуждения нереализуемы в реальном времени ввиду огромного количества последовательных элементарных шагов. Даже строгие математические доказательства на много порядков короче рассуждений, формализованных в стиле логики предикатов. Человеческая способность быстро рассуждать (на которую, к сожалению, обращается гораздо меньше внимания, чем на

способность быстро узнавать) основана на использовании образно-схематических структур. Это отмечалось еще в книге Sowa 1984.

Можно наметить следующие направления исследований в русле изложенных идей:

- формализация типологий когнитивных категорий и организация знаний на их основе;
- исследование и формализация проблемы гештальта и связи гештальтов с понятиями базового уровня; на решение этой проблемы была, в частности, ориентирована модель псевдооптической нейронной сети (Кузнецов 1996);
- формализация быстрых рассуждений на основе образно-схематических структур.

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КОГНИТИВНОЕ МОДЕЛИРОВАНИЕ СПРАВЕДЛИВОСТИ В КОАЛИЦИЯХ

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Когнитивное компьютерное моделирование в процессах поддержки принятия решений направлено на поддержку познавательных процессов лица, принимающего решение. Обычно такое моделирование базируется на экспертных знаниях о процессах, происходящих в системах физической, социальной, политической природы, а поддержка принятия решений заключается в активизации ментальных процессов рассуждения, структуризации, категоризации и т.д.

В этой работе исследуется возможность моделирования когнитивных процессов субъектов в малых социальных группах – коалициях, образованных для решения сложных задач управления динамической социальной, политической или экономической системой в условиях неопределенности.

В математике традиционно исследованием образования коалиций занимается кооперативная теория игр, в которой участников коалиции называют игроками (Оуэн, 1971). Здесь при условии полной информированности, рациональности и интеллектуальности игроков предлагаются методы нахождения устойчивых коалиций. Устойчивой коалицией считается

коалиция, в которой любому игроку невыгодно ее покидать. Устойчивость коалиции достигается таким дележом выигрыша коалиции, который лишает игроков мотиваций выхода из коалиции. К сожалению, упомянутые методы формирования коалиций, полученные в условиях сильных допущений о полной информированности, рациональности и интеллектуальности игроков, не позволяют создавать коалиции в условиях неопределенности. Кроме этого, алгоритмы, реализующие методы нахождения устойчивых коалиций, имеют экспоненциальную сложность вычислений относительно числа игроков, что ограничивает возможность их практической реализации в компьютерных системах поддержки принятия решений.

В условиях неопределенности коалиции образуются в результате переговоров между игроками, где путем нахождения компромиссных решений стороны добиваются устойчивых мотиваций для образования коалиции каждого игрока, достижимых в случае справедливого дележа выигрыша. При этом критериями справедливого дележа являются трудно формализуемые ощущения каждого участника коалиции в справедливости дележа, неформально определяемые как: отсутствие у игроков зависти; ощущение игроков в равноценности долей и эффективности дележа (Брамс, 2003).

Основная идея изложенного подхода заключается в моделировании механизмов функционирования коалиции и ощущений игроков в справедливости дележа выигрыша коалиции. Предложенная когнитивная модель справедливости в коалициях основана на исследованиях социальных психологов Д. Хоманса (1964) и Л. Фестингера (1999).

В этих работах предложены, соответственно, концептуальная модель функционирования малых социальных групп на основе обмена полезностями, а также концепция когнитивного диссонанса, позволяющая оценить субъективные ощущения участников коалиции в справедливости дележа ее выигрыша.

Предложенная модель формирования коалиции основана: на модели объекта управления представленной нечеткой когнитивной картой (Kosko, 1986); нечетких экспертных оценках цели (g_i) и стратегии достижения цели (r_i) игроков, участвующих в конфликте. Каждый игрок, $i \in N$, определен четверкой: цель игрока – g_i ; стратегия достижения цели – r_i ; эффективность достижения цели (отношение выигрыша при достижении цели к затратам на ее достижение) – e_i ; возможность достижения цели

собственными силами в условиях противодействия противников – μ_i .

В работе сформулированы необходимые и достаточные условия образования устойчивой коалиции ($K \subseteq N$). Необходимым условием для образования коалиции считается близость целей всех игроков, участвующих в коалиции. Однако выполнение необходимого условия не позволяет судить об устойчивости коалиции. Достаточные условия образования коалиции сформулированы как критерии устойчивости коалиции, характеризующие справедливость дележа выигрыша коалиции между ее участниками.

Предложены три критерия, позволяющие судить об устойчивости коалиции и, соответственно, справедливости в коалиции. Это критерии: взаимной полезности; когнитивного диссонанса и привлекательности игрока в коалиции (Kulinich, 2011).

Критерий взаимной полезности основан на теории социального поведения субъектов в малой группе (Хоманс, 1964) на основе обмена полезностями. Анализируется взаимная полезность игроков при объединении их ресурсов для достижения общей цели. Идеальным считается случай, когда все игроки одинаково полезны друг для друга. В этом случае образуется устойчивая коалиция, построенная на принципах справедливости. Дисбаланс во взаимной полезности игроков в коалиции создает у них ощущение несправедливости, которые увеличивают мотивации выхода игроков из коалиции. Для оценки ощущений игроков о справедливости в коалиции используется критерий когнитивного диссонанса.

Критерий когнитивного диссонанса. Наличие дисбаланса взаимной полезности игроков, включенных в коалицию, приводит к возникновению скрытых (латентных) конфликтов в коалиции, наличие которых для каждого игрока определяется уровнем его когнитивного диссонанса. Когнитивный диссонанс – это противоречие в системе знаний человека, побуждающее его к действиям, направленным на устранение этого противоречия (Фестингер, 1999). Возможные действия игроков, вызванные когнитивным диссонансом: изменение поведения; изменение знаний об объекте; игнорирование ситуации (Фестингер, 1999), могут привести их к выходу из коалиции, т.е. к неустойчивости коалиции. Исследуются возможности компенсации когнитивного диссонанса игроков. По этому критерию коалиция считается устойчивой, если когнитивные диссонансы всех игроков в коалиции близки к нулю.

Критерий привлекательности игрока в коалиции. Критерии взаимной полезности и когнитивного диссонанса, определяют устойчивую коалицию, как коалицию равных и всем довольных игроков. Однако, в реальных ситуациях полезности, которыми обмениваются игроки, могут быть неодинаковыми и когнитивные диссонансы игроков могут быть не равными нулю. Для принятия решений по выбору сторонников по коалиции в таких условиях, предложен критерий привлекательности игроков для образования коалиции. Этот критерий строится как функция двух переменных $m_q = f(m_{eq}, m_{\mu})$, где m_{eq} – уровень мотиваций участия в игрока конфликте, а m_{μ} – уровень мотиваций объединения в коалицию. Предложена экспертная процедура определения привлекательности игрока в коалиции, для разных уровней их мотиваций участия в конфликте и мотиваций объединения в коалицию.

Система поддержки принятия решений, основанная на предложенной когнитивной модели справедливости в коалициях может быть использована при подготовке переговоров по образованию коалиции в условиях неопределенности.

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НЕЙРОНАЛЬНЫЕ ОСНОВЫ КРАТКОВРЕМЕННОЙ ПАМЯТИ, ВОЗНИКАЮЩЕЙ В ЭВОЛЮЦИИ КОГНИТИВНЫХ АГЕНТОВ

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Наибольший интерес в рамках изучения феноменов нервной деятельности представляют механизмы обеспечения целенаправленного поведения, формирование которого обусловлено эволюцией и обучением. Непосредственное изучение на лабораторных животных нейрональных основ процесса синтеза решения в рамках проблемной ситуации крайне затруднительно в связи с несовершенством технических методов регистрации активности головного мозга в свободном поведении. В данной ситуации подходы математического моделирования адаптивного поведения на основе нейроморфных управляющих систем позволяют находить общие закономерности формирования поведения в рамках упрощенных моделей.

Алгоритмы машинного обучения, и, в частности, подходы обучения с подкреплением (Botvinick et al. 2009), позволяют проводить синтез управляющей структуры автономных агентов в модельной среде. Тем не менее подобные подходы не имеют нейронального базиса в качестве управляющей поведением структуры.

Это делает практически невозможным проведение параллелей с феноменами, наблюдаемыми в ходе их изучения, с возможными механизмами когнитивной деятельности мозга. Феномен кратковременной памяти в рекуррентных нейроморфных структурах широко освещен в литературе, в том числе с точки зрения реверберации сигнала в сети (Hochreiter et al. 2001) и воспроизведения последовательностей активаций (Botvinick and Plaut 2006). Однако вопрос формирования поведения на основе кратковременной памяти, а также механизм автоматической генерации модельной нейросетевой структуры, способной к хранению памяти, на данный момент недостаточно исследован.

В разрабатываемой модели состояние среды, в которой моделируется поведение автономного агента, кодируется бинарным вектором, каждый бит которого может быть интерпретирован как некоторый признак среды. Действия агента по отношению к среде состоят в непосредственном изменении битов вектора состояния, при этом за один такт дискретного времени может быть изменен только один бит. В среде содержатся цели различной сложности, которые определяются как последовательность действий по изменению битов вектора состояния среды. Такое определение целей позволяет сконструировать структуру конкурирующих целей, что является адекватным отображением реального мира, в котором

многочисленные цепочки действий в конечном счете приводят нас к достижению того или иного адаптивного результата. С каждой целью среды ассоциируется награда, которую агент накапливает в процессе поведения, достигая различных целей. При этом набираемая награда никак не влияет на текущее поведение агента. В рамках исследования рассматриваются как стационарные среды, изменение состояния которых происходит только под действиями агента, так и нестационарные, изменения которых происходят в том числе и случайно.

Поведение агента в среде управляется формальной нейронной сетью произвольной топологии (с возможностью формирования рекуррентных связей). Текущий вектор состояния среды подается в качестве сенсорной информации на выходной слой нейросети, а выходной слой кодирует совершаемое агентом действие. Для моделирования эволюции в среде создается популяция независимых нейроморфных агентов. Накопленная награда каждого агента влияет на его репродуктивный успех в процессе эволюции, то есть на вероятность его отбора в качестве родителя одного из представителей следующей популяции. В качестве эволюционного алгоритма используется модернизированный алгоритм NEAT (Kenneth and Miikkulainen 2002), позволяющий осуществлять структурные мутации топологии управляющей нейросетевой структуры – дубликацию нейронов и добавление синапсов, а следовательно, развивать архитектуру сети в процессе эволюции.

Результаты моделирования показывают, что агенты, эволюционировавшие в условиях

нестационарной среды, функционируют успешнее – в среднем набирают большую награду – и в большинстве случаев обладают более обширным репертуаром поведения. При исследовании эволюционной динамики популяции агентов было обнаружено, что периоды резкого повышения приспособленности сопровождаются значительным увеличением частоты выработки новых стратегий поведения.

Анализ поведенческих стратегий, появляющихся в результате эволюции, показал, что агенты приобретают способность хранить кратковременную память за счет обратных связей и принимать решение о совершаемом действии путем интеграции текущей сенсорной информации о среде и ревербирующего в сети сигнала. Наличие кратковременной памяти у агентов подтверждается возможностью выработки политик поведения на основе альтернативных действий, когда из одного состояния совершаются различные действия в зависимости от предыдущей истории поведения (рис. 1А). Анализ нейрональной активности в моменты, соответствующие совершению альтернативных действий, позволяет определить, что на принятие решения влияет значительное изменение активности небольшого числа нейронов (рис. 1Б). Таким образом, подобные нейроны можно назвать специализированными относительно совершения действий в конкретной поведенческой ситуации.

Использование кратковременной памяти для формирования политик поведения позволяет реализовывать значительно более сложное поведение и набирать большее количество награды

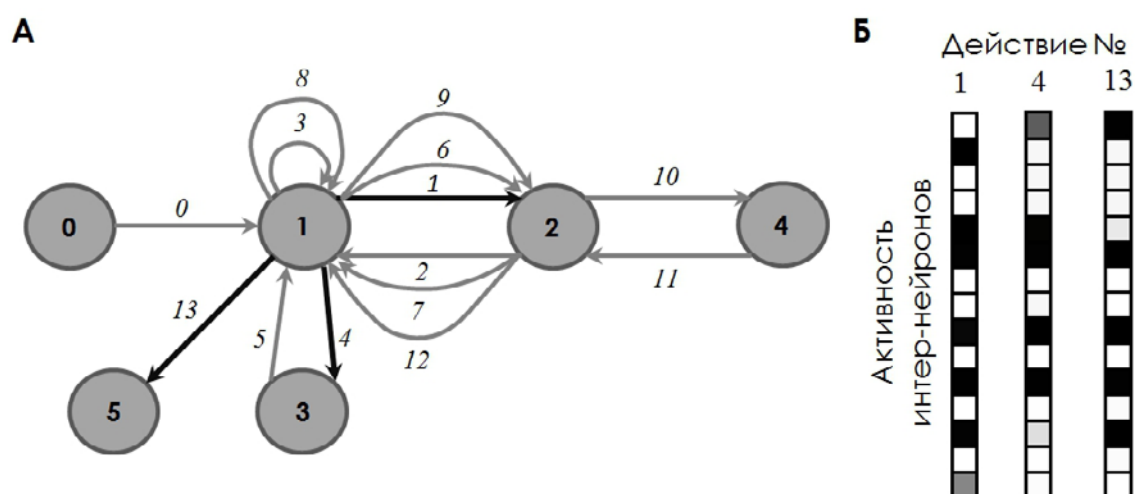


Рис. 1. А. Пример альтернативного поведения (кругами обозначены состояния, стрелками – переходы/действия агента с указанием последовательности совершения); Б. Активность интер-нейронов сети при совершении трех альтернативных действий (черный цвет – максимальная активность соответствующего нейрона, белый – нулевая активность)

в процессе жизни. Возникновение возможности оперировать кратковременной памятью происходит без задания каких-либо искусственных предпосылок к данному феномену в строении эволюционного алгоритма.

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ОБ ОДНОМ ПОДХОДЕ К АНАЛИЗУ РАЦИОНАЛЬНОГО ПОВЕДЕНИЯ КАК ЗАДАЧЕ КОГНИТИВНОЙ СОЦИОЛОГИИ

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Взгляд на когнитивную социологию как на дисциплину, призванную изучать лишь социальные особенности когнитивного поведения (Zerubavel 1997), оказывается ограничивающим возможности этого направления. Более широкое понимание предполагает включение в число объектов исследований как собственно подходов к познанию социальной действительности, так и различных аспектов когнитивных особенностей социального поведения (Михеенкова 2010, Михеенкова 2011). В этой связи чрезвычайно интересным представляется проекция идей классической «понимающей социологии» М. Вебера (Вебер 2006) на эту область. Так, изучение описанных М. Вебером четырёх типов рационального поведения – целе-рационального, ценностно-рационального, традиционного и аффективного – может рассматриваться как одна из задач когнитивной социологии.

Анализ рационального поведения оказывается поддающимся формализации в рамках аргументационной теории рациональности (Финн 2008). В работах Гусакова и др. 2009, Финн и др. 2008 рассматривается подход к выявлению детерминаций поведения, связанных со структурированным представлением субъекта поведения в виде множества дифференциальных признаков, характеризующих социальные, индивидуальные и биографические его особенности. Детерминанты поведения определяются средствами ДСМ-метода автоматического порождения гипотез на основе анализа сходства описаний k субъектов, демонстрирующих одинаковые эффекты поведения, $C' = \bigcap_{i=1}^k C_i$. Там же предложено представление опроса¹ мнений по теме T^* на основании задания множества утверждений $P = \{p_1, \dots, p_n\}$ (каркаса темы), раскрывающих содержание темы. Отношение

к элементам каркаса позволяет сформировать аргументированное отношение к теме в целом. Подобное представление может быть распространено на анализ рационального поведения вообще (мнение представляет собой частный случай поведения).

Пусть выбор действия осуществляется с учётом соображений, представленных множеством P . В этом случае можно говорить о различных типах рационального поведения – поведение определяется не только особенностями субъекта, но и его осознанным выбором. Заметим сразу, что отсутствие влияния такого выбора позволяет рассматривать этот тип поведения как аффективный в смысле М. Вебера.

Пусть, следуя работе Финн и др. 2008, A – множество аргументов или контраргументов (аргументационная база) относительно принятия или непринятия некоторых утверждений, например, составляющих каркас $P = \{p_1, \dots, p_n\}$ темы T^* . Определим функции $g^+(p_h): p_h \rightarrow 2^A$ и $g^-(p_h): p_h \rightarrow 2^A$, $h = 1, \dots, n$, для каркаса P $g^+: P \rightarrow 2^A$ и $g^-: P \rightarrow 2^A$. Таким образом, для i -го субъекта определяются его аргументационные функции $\vec{G}_i = \langle g_i^+(p_1), \dots, g_i^+(p_n), g_i^-(p_1), \dots, g_i^-(p_n) \rangle$, где $\vec{G}_i^\sigma = \langle g_i^\sigma(p_1), \dots, g_i^\sigma(p_n) \rangle$, $\sigma \in \{+, -\}$, $g_i^\sigma(p_h) \subseteq A$, $h = 1, \dots, n$, $i = 1, \dots, s$, где s – число участвующих в опросе респондентов. Обязательным условием рационального выбора является $g_i^+(p_h) \cap g_i^-(p_h) = \emptyset$, $h = 1, \dots, n$.

При включении аргументационной функции в описание субъекта средства ДСМ-метода позволяют выявить не только личностные и социальные, но и рациональные составляющие детерминаций поведения – на основе анализа сходства аргументационных функций сходных по своим характеристикам субъектов, $\vec{G}' = \bigcap_{i=1}^k \vec{G}_i$ (см. Финн и др. 2008). Если среди выявленных аргументов доминируют прагматические соображения оптимального достижения цели, можно говорить о целе-рациональном поведении в смысле М. Вебера, если наличествуют

ценностные соображения – о ценностно-рациональном. Отметим, что возможность выявления такого поведения была подтверждена эмпирическим путём – в описанном в [Климова и др. 2009] исследовании включение в описание респондента обобщённых установок ценностно-нормативного характера позволило зафиксировать их влияние на поведение. Таким образом, даже в отсутствие аргументационной составляющей ДСМ-метод обладает возможностями анализа рационального поведения – было бы предложено достаточно адекватное описание актора. При соответствующем представлении аргументации может быть также охарактеризовано традиционное поведение.

Явное представление аргументации, используемой при реализации поведения, открывает возможности для кластеризации социума на основе единства и непротиворечивости аргументационного пространства (о формировании социальных общностей на основе детерминант поведения и мнений см. (Гусакова и др. 2009)). Так, при выполнении условия $\forall p \forall X \forall Z ((g^+(X, p) \cap g^-(Z, p) = \emptyset) \& (p \in P))$, где $g^+(X, p)$, $g^-(Z, p)$ – аргументационные функции субъектов X и Z , соответственно, мы имеем дело с абсолютно рациональным сообществом. Дополнительные условия $\forall p \forall X \exists Z ((g^+(X, p) \cap g^-(Z, p) = \emptyset) \& (p \in P))$ и/или $\forall p \forall X \exists Z ((g^-(X, p) \cap g^+(Z, p) = \emptyset) \& (p \in P))$ обеспечивают покрытие социума группами с идеально согласованным поведением (мнением).

В рамках представления об анализе рациональности как одной из задач когнитивной социологии предлагаются логические инструменты для вычисления различных критериев рациональности (понимаемой как аргументированное

принятие решений) опроса (Finn et al. 2011). А выявление структурно выраженных причинных зависимостей логическими средствами ДСМ-метода (реализованного в интеллектуальных системах типа ДСМ), недоступное с помощью статистических инструментов, позволяет говорить об интеллектуальном анализе социологических данных – извлечении нового знания из эмпирического материала. Тем самым обеспечивается автоматическое решение задач когнитивной социологии.

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МОДЕЛЬ РЕФЛЕКСИИ В СТРУКТУРЕ ОНТОЛОГИЧЕСКОЙ СИСТЕМЫ

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В современных исследованиях проблема рефлексии рассматривается, по крайней мере, в трех направлениях: при изучении мышления, самосознания личности, а также процессов коммуникации и кооперации [1]. Изучение рефлексии при решении разного рода мыслительных задач направлено на выявление условий и осознания оснований системы собственных

знаний и мышления. В статье рассматривается рефлексия в аспекте процессов мышления, самоосознания структур представления знаний и механизмов мышления. В работах Д. Райнери, как отмечается в [2], введено понятие «онтологической» рефлексии как способности пребывать в логике содержания знания. Следуя этому определению, для моделирования онтологической рефлексии необходимо разработать механизм, позволяющий интеллектуальной системе отслеживать внутреннюю логику содержания знания, включающую модели представления и обработки знаний. Содержательно близкое определение рефлексии используется и в информатике, где рефлексия означает

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ПОВЕДЕНИЕ, УПРАВЛЯЕМОЕ КАРТИНОЙ МИРА

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Исследование феномена целенаправленного поведения и моделирование такового входит в число важнейших проблем искусственного интеллекта. Главной задачей здесь является синтез плана поведения в условиях как прогнозируемой, так и непрогнозируемой среды, которая рассматривается как задача поиска, имеющая комбинаторный характер, а основные усилия при её решении направлены на борьбу с вычислительной сложностью.

В качестве информации, доступной планировщику, обычно выступают начальное состояние, описание цели и множество допустимых действий, с каждым из которых связаны условия его применения и эффект – те изменения в среде, которое оно производит. В случае иерархического планирования или планирования на основе прецедентов используется, помимо того, множество частичных планов или прецедентов, соответственно.

Однако ни один из имеющихся подходов не рассматривает задачу целеполагания – выдвижения новой цели: цель или множество целей считаются заданными. В то же время эти две задачи – выдвижения цели и собственно построения плана – неразрывно связаны и, как показано в ряде исследований, для их решения используются иные механизмы, нежели в существующих интеллектуальных планировщиках. К таким механизмам относятся механизмы мотивации, смыслы, картины мира и др. Иначе говоря, в решении этой задачи главную роль играют механизмы сознания и самосознания.

В настоящем докладе решение указанных задач опирается на знаковое опосредование, точнее, на представление сознания как системы знаков с семействами зависимостей, связывающих как компоненты знака, так и всё множество знаков.

По А. Н. Леонтьеву [1], элемент сознания состоит из трех компонент: образа, назначения и личностных смыслов. Назначение объекта, его образ и личностные смыслы могут

не связываться в единое целое, и тогда психическое отражение фиксирует для субъекта биологический смысл объекта, его перцепт и функциональное значение в решаемой задаче. Такое отражение позволяет осуществлять лишь «парные» переходы между двумя компонентами знания об объекте: от биологического смысла к перцепту – выбор конкретного объекта, наилучшим образом удовлетворяющего заданным критериям, от перцепта к функциональному значению – выбор способа использования конкретного объекта, от функционального значения к биологическому смыслу – выбор «цели» для конкретного действия. Указанный способ отражения не позволяет строить многоходовые планы, поскольку три аспекта знания об объекте связаны лишь парными зависимостями и нужен «внешний наблюдатель», чтобы увидеть, что это три стороны одного элементарного «треугольника» знания.

Возможность рассмотрения объекта как целостного и существующего независимо от текущего состояния действующего субъекта (т.е. внешнего наблюдателя) обеспечивается связыванием упомянутых трёх компонент в единое целое посредством введения их общего имени. Таким образом, возникает структура, называемая в прикладной семиотике знаком [2]. При этом образ, действие и назначение объекта трансформируются, так как входят в сознание как элементы не просто знания, а как компоненты знака. Эта трансформация состоит в том, что их использование опосредствовано именем: сам объект приобретает значение (становится социально значимым предметом), личный опыт действия с ним отражается в личностном смысле, а событие восприятия объекта, представляющее собой отражение в симультанном «рисунке» процедуры воспроизведения свойств объекта моторикой воспринимающего органа, фиксируется как образ или представление об объекте.

Взаимодействие компонент различных знаков приводит, в конечном счете, к формированию индивидуальной картины мира агента; точнее, трех картин мира: картина мира, построенная на образах как компонентах знаков, картина мира,

построенная на личностных смыслах (действиях, применимых к объекту, которому соответствует данный знак) как компонентах знаков, и картина мира, построенная на значениях как компонентах знаков. Имена знаков могут наследовать одну из трех возникающих структур, а фиксация одной из них, порожденной образами, либо смыслами, либо значениями, порождает точку зрения субъекта.

В процессе взаимодействия знаков на множестве их образов формируются отношения, рассматриваемые в докладе; ясно, что среди таких отношений должны быть отношения сходства, противопоставления и вхождения. При работе субъекта с картиной мира, образованной смыслами, используются процедуры поглощения (один смысл поглощает другой), объединения по смыслам (агглютинация) и противопоставления. При работе с картиной мира, образованной значениями, строятся ситуативные классификации, роли и сценарии. В итоге формируется сюжетно-ролевая картина мира.

Заметим, что имена знаков являются при этом элементами системы языка, что создаёт новые связи между знаками – связи, определяемые языковой нормой, и связи, определяемые узусом (например, профессиональным). Принципиальным здесь является то, что система языка выступает как эвристическая машина для формирования новых знаков. В наиболее простом случае, на основе указанных соображений возникает некоторая динамическая модель «сознания», рассматриваемая в докладе. Каждая из компонентов этой модели также является динамической системой. Добавим также, что компоненты знака связаны между собой отображениями, которые и позволяют рассматривать знак как единое целое и переходить от одной компоненты знака к другой.

В результате решения возникающих перед ним задач у субъекта накапливаются не только знания о мире, но и знания о самом себе. Это

опыт о том, что субъект может делать с предметом (предпочитаемые значения), о том, какие признаки оказались для него более надёжными при распознавании предмета (предпочитаемые правила построения образа), и о том, что даёт ему оперирование данным предметом (предпочитаемые смыслы). Эти соображения лежат в основе модели, которую назовем моделью самосознания субъекта. Модель поведения, основанного на сознании, включает и представление об особом виде мотивации, сопровождающем работу сознания. Познавательная потребность преобразуется с появлением сознания в особую потребность работать со знаками – потребностью в означивании. В системе рассматриваемых в докладе моделей работа индивидуального сознания реализуется через поиск знаков. Для деятельности, мотивированной работой со знаком, действиями становятся работа с именем-значением, именем-образом, именем-смыслом, т.е. процессы категоризации, интерпретации и концептуализации соответственно.

Возникающие в результате работы этих процедур знаки представляют элементы картины мира, а вся структура, построенная с использованием трёх типов структур, реализующих отношения на именах-понятиях, именах-комплексах и именах-синкретах – картину мира субъекта. В этой картине мира предусмотрены механизмы перехода с понятий профессиональной картины мира на оперирование быденными представлениями и к обобщениям мифологической картины мира. Изложенные соображения лежат в основе модели поведения субъекта, рассматриваемой в докладе.

А. Н. Леонтьев.

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МОДЕЛИРОВАНИЕ ПОТРЕБНОСТЕЙ И МОТИВОВ ИНТЕЛЛЕКТУАЛЬНОГО АГЕНТА СО ЗНАКОВОЙ КАРТИНОЙ МИРА

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В работе описывается способ моделирования потребностей и мотивов интеллектуального агента, действующего на основе

знаковой картины мира. Модель агента основывается на психологической теории деятельности Леонтьева (2005), и понятия мотива и потребности рассматриваются именно с этой точки зрения. Представления агента о мире отражаются в картине мира, структурной единицей которой служит знак. Связанные между собой знаки

образуют семиотическую сеть, а протекающие в этой сети процессы формируют целенаправленное поведение агента.

Знак и семиотическая сеть

Кратко опишем модели знака и семиотической сети, основываясь на работе Осипова Г.С. и др. (2011), в которой знак считается минимальным объектом (элементом) сознательных процессов. Будем называть знаком следующее отображение множества имен на множество троек $N \rightarrow \{b|b = (m, a, p)\}$, такое что $S(n) = (m, a, p)$, $n \in N$, где

- n – имя знака в некоторой системе имен (языке),
- b – основание знака – тройка структурных элементов знака, которые самостоятельно не осознаются;
- $m = (m_o, m_a)$ – значение знака, обусловленное историей развития того коллектива, в котором происходит деятельность агента, и условно разделяемое на два подкомпонента: определение $m_o = (M_{mo}, R_{mo})$ и назначение $m_a = (M_{ma}, R_{ma})$ – являющиеся некоторыми фрагментами семантической сети на значениях с соответствующими типами отношений;
- $p = \{(P_p, R_p), \Lambda_p\}$ – образ отражаемого знаком объекта реальной среды, представляющий собой фрагмент семантической сети на образах с соответствующими типами отношений и некоторую процедуру распознавания этого образа Λ_p ;
- $a = \{(P_a, R_a), Q_a\}$ – множество личностных смыслов знака, где каждый личностный смысл представляет собой образ некоторой ситуации и соответствующую этой ситуации оценку совершенного действия Q_a .

Основываясь на определении знака, можно выделить три типа семантических сетей: сеть на значениях, сеть на образах и сеть на смыслах. Надстраивая над этим набором четвертый тип сети – семантическую сеть на именах, отношения на которой транслируются (выводятся) с отношений нижележащих сетей с помощью определенных процедур, мы получаем семиотическую сеть. При этом осознаваемой частью, выводимой на коммуникативный уровень, является только непосредственно сеть на именах, отношения на которых задают структуру сообщений в коллективе, используемых при коммуникации. Остальные три типа сетей образуют неосознаваемый уровень, на котором разворачиваются процессы активации потребности и образования мотива.

Если приводить примеры знаков, задавая имена с помощью естественного языка, то считается, что отдельным знакам соответствуют не

только отдельные именные группы («обеденный стол», «животные», «совесть»), но и предикатные группы («прыгать», «писать»).

Динамика в картине мира агента

Описывая когнитивного интеллектуального агента со знаковой картиной мира, можно выделить три уровня динамики в картине мира:

- перцептивная динамика, к которой относится процесс обновления перцептивного фокуса внимания (постоянное перестроение текущей наблюдаемой ситуации, которую в любой момент можно вывести на сознательный уровень),
- ситуационная динамика, к которой относятся процессы в сознательном фокусе внимания: планирование действий и предсказание развития ситуаций,
- концептуальная динамика, к которой относится процесс коллективного обобщения некоторого опыта отдельных субъектов с образованием нового значения старого знака или нового знака с новым значением.

Потребность и мотив играют ключевую роль в запуске и в сопровождении процессов второго уровня – уровня ситуационной динамики. При этом также играет большую роль процедура разворачивания образа по структуре (по структурным отношениям «состоит из» и других на сети образов) и по времени (по временным отношениям-меткам на сети образов). Можно считать, что ситуационная динамика в картине мира – это эволюция структуры знаков за счет управляемого или неуправляемого разворачивания образа этой структуры знаков. Неуправляемое разворачивание – это предсказание развития ситуации без учета активного участия субъекта в ней, а управляемое, соответственно – с учетом, т.е. планирование, которое осуществляется только при активизации некоторой потребности, придающей смыслы знакам в фокусе сознательного внимания.

Деятельность в картине мира

Будем рассматривать только тот случай, когда потребность и мотив осознаются в ходе деятельности. Опишем упрощенно линейный этап в процессе деятельности.

Запуск процесса деятельности осуществляется на неосознаваемом уровне активизацией потребности. Активизация потребности моделируется различными способами, один из которых следующий. Осуществляется постоянное вычисление некоторой меры напряженности на развернутом образе текущей ситуации (не только внешней, но и внутренней) из перцептивного фокуса внимания с помощью расчета структурной согласованности на фрагменте семантической

сети (используя работу Дулина С.К. 2005). Некоторый фрагмент с максимальной мерой напряженности становится образом активизирующейся потребности. По образу потребности происходит поиск имени, затем осознание и называние потребности. Запускается процесс поиска предмета потребности, значение которого становится целеобразующей частью мотива. Смысл предмета потребности задает смыслообразующую часть мотива, которая является энергетической подпиткой всех последующих этапов.

Разворачивание образа предмета потребности по структуре в простейшем случае приводит к построению целевой ситуации. Затем в сознательный фокус планирования помещается начальная ситуация (из перцептивного фокуса или ранее построенная) и запускается процесс

планирования – управляемого разворачивания образа по времени. Последний этап – непосредственная реализация построенного плана.

Таким образом, в настоящей работе предложена схема моделирования потребностей и мотивов интеллектуального агента со знаковой картиной мира и описана их роль в процессах, формирующих целенаправленное поведение интеллектуального агента со знаковой картиной мира.

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К ВОПРОСУ ОБ ОПЕРАЦИОНАЛИЗАЦИИ ПОНЯТИЯ «КАРТИНА МИРА»

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Работа посвящена экспериментальному изучению картины мира как источника фиксированных познавательных гипотез. Предложена процедура изучения типа фиксированных гипотез и исследованы некоторые психологические особенности людей, обладающих той или иной картиной мира. Методологическую основу проведённого исследования составили представления А.Н. Леонтьева о строении сознания и Л.С. Выготского о развитии значения слова и зоне ближайшего развития.

Введено представление о четырёх типах картины мира, различающихся тем, какая сторона деятельности составляет основу познавательных гипотез. Поскольку любая деятельность имеет некий индивидуальный смысл для субъекта, значение в жизни микро/макро социума и объективно-вещное пространственно-временное содержание, то и отражение деятельности в форме установок предполагает формирование субъектом отражения трёх типов гипотез. Смысловая «проекция» деятельности на «экран» картины мира даёт аффективно насыщенный сюжет, главным героем которого является субъект деятельности. Значение деятельности и значение отдельных действий и операций проецируются в индивидуальное сознание в форме представлений о ситуациях взаимодействия и ролях. Вещная, объектная сторона деятельности

отражается в форме концепта, который задаётся предметом, выделяемым этим понятием из объекта, и методом, с помощью которого эта процедура экстрагирования предмета может быть осуществлена. Фиксация гипотез о смысле порождает мифологическую картину мира (МКМ), о значениях и ролевых взаимодействиях – житейскую (ЖКМ), о предмете и методе его распознавания в объекте – рациональную (РКМ). Конституирующим познавательным актом для рациональности является обнаружение точки зрения – именно при ориентации на выделение предмета в объекте понятие точки зрения становится содержательно наполненным и технически необходимым. Сбой рациональности, т.е. неудача в задаче самостоятельного конструирования субъектом предмета деятельности, приводит к выхолащиванию РКМ, подмене установки на выбор предмета установкой на обесценивание любого найденного предмета. Фиксация на неудаче при формировании гипотез о предметах порождает нигилистическую картину мира (НКМ).

Возможность диагностики ведущей картины мира как источника фиксированных гипотез основывается на следующих рассуждениях. С точки зрения содержания картины мира, её разновидности можно представить себе как расположенные на шкале от всеобщего и аффективного к уникальному и рациональному. Мифологическая картина мира позволяет человеку соотнести себя с миром общечеловеческих переживаний и действий; житейская – с

комплексом намерений, поступков и оценок, характерных для группы, выделенной по тому или иному внешнему основанию; рациональная – с собственной точкой зрения на интересующие человека предметы. Что же касается нигилистической картины мира, то условно её можно рассматривать как попытку расщепить и перемещать полюса, навязывая свою рациональность общечеловеческому и мня свою аффективность уникальной.

Экспериментальной ситуацией, в которой могут проявиться особенности рациональной картины мира как источника познавательных гипотез, является ситуация обобщения с требованием объяснения его оснований. Для того же, чтобы в этой ситуации могли быть задействованы и житейская, и мифологическая картины мира, необходимо ввести, во-первых, представление о роли, исполняя которую, испытуемый и предлагает свои обобщения, а, во-вторых, стимульный материал, допускающий проекцию.

Процедура выявления источника фиксированных гипотез была построена как метод исключения «четвёртого лишнего» на материале, имеющем концептуальную основу, но допускающем как проекцию, так и функциональную интерпретацию. Поскольку мы исходим из предположения, что каждый современный взрослый европеец имеет возможность структурировать реальность всеми тремя способами, то преобладающая роль одного из них в индивидуальном стиле познания может быть выявлена именно при изучении устойчивости избранного способа к давлению роли и обретению действием обобщения нового смысла. Соответственно, испытуемому была предоставлена возможность воспроизвести привычный для него ход мыслей (констатирующая серия), изменить смысл производимой операции обобщения и, возможно, найти иные способы обобщения (формирующая серия), отрефлексировать основания предпочитаемого способа обобщения (контрольная серия).

Стимульный материал состоял из трёх наборов объектов – фотографий произведений изобразительного искусства и архитектуры. В каждом наборе было представлено от четырёх до шести объектов, допускающих обобщения как по формальным признакам изображённого (назначение/ возраст/ состояние постройки, пол/ возраст/ социальная принадлежность/ эмоциональное состояние персонажей картины и назначение/ состояние изображённых предметов), так и на концептуальном основании, опирающемся на свойства изображения (жанр и стиль). Также все предъявленные объекты допускали

формирование в отношении них яркого эмоционального переживания.

В качестве показателей, на основе которых диагностировался тип картины мира испытуемого, использовались: 1) тип обобщения – синкрет, комплекс, потенциальное понятие, понятие; 2) направленность внимания – на собственное переживание, возникающее в связи с изображённым/изображением, на функцию изображённого объекта, на свойства изображения (предмет); 3) характер ЗБР – сдвиг направленности внимания под влиянием роли; 4) направленность сознательно выбранного основания обобщения.

В пилотажном исследовании приняли участие 49 испытуемых (студенты-психологи). Оценивались различия между группами, образованными на основании типа картины мира (с помощью критерия Манна-Уитни). Носителей МКМ в нашей группе оказалось всего два человека, поэтому в сравнении групп их данные не участвовали.

Владельцы РКМ отличаются от носителей ЖКМ большей чувствительностью и утончённостью (фактор I теста Кеттелла), более высокой верой в собственную уникальность (опросник нарциссизма Шамшиковой, Клепиковой), меньшей верой в контролируемость мира (шкала базовых убеждений Янофф-Бульман). Согласно психосемантической процедуре исследования ценностных образований (ЦСД Кузнецовой), они больше ценят Классику и Архитектуру, больше видят пользы в Доверии и меньше – в Порядке. От владельцев НКМ они также отличаются большей утончённостью (I по тесту Кеттеллу), более высоким контролем над чувствами (опросник перфекционизма Гараян, Холмогоровой) и тем, что меньше пользы видят в Конфликте (ЦСД).

Носители ЖКМ отличаются от владельцев НКМ более высокой склонностью к гневу (опросник склонности к агрессии Басса-Перри) и более выраженными чертами тревожного (опросник черт характера Маноловой, Русалова). Согласно ЦСД, они больше ценят Порядок и считают Безопасность более полезной.

Полученные результаты представляются разумными – люди с рациональной картиной мира отличаются большей чувствительностью, утончённостью, склонностью к рефлексии и безразличием как к порядку, так и к конфликтам. Хорошо согласуется с их ориентацией на формирование собственной точки зрения и вера в собственную уникальность.

Воркшоп «Особенности активности мозга в норме и при различных видах психической патологии» / Workshop “Brain activity in norm and psychic pathologies”

Ведущая: Валерия Борисовна Стрелец
Chair: Valeria B. Srtelets

ОСОБЕННОСТИ АКТИВАЦИИ КОРЫ ГОЛОВНОГО МОЗГА ПРИ ВООБРАЖЕНИИ, ПРЕДЪЯВЛЕНИИ И ПРИПОМИНАНИИ ВИДЕОСЮЖЕТОВ ПО ДАННЫМ ФМРТ

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Показано, что использование стимулов, имеющих высокую экологическую валидность, приводит к усилению активации коры головного мозга (Hasson U. et al., 2010). В качестве таких стимулов были использованы короткие видеофрагменты с сюжетами «Прыжок с парашютом» и «Лекция в аудитории». Повторяемость гемодинамических ответов на предъявление видеосюжетов, по крайней мере, в префронтальной

коре, была обнаружена ранее (Jääskeläinen I. P. et al., 2008).

В эксперименте принимал участие 21 здоровый доброволец – 13 мужчин и 8 женщин в возрасте 20–38 лет (средний возраст 23 года). Все испытуемые были обследованы на предмет наличия заболеваний нервной системы.

Во время регистрации фМРТ испытуемый выполнял 9 блоковых парадигм, каждая из которых длилась 3 мин и состояла из 3 блоков. Блок включал в себя базовую стимуляцию (точку фиксации или задачу парадигмы) и задачи парадигмы длительностью по 30 сек.

Задачами парадигмы являлись представление себя на месте участника двух сюжетов, просмотр видео двух сюжетов, немедленное представление после просмотра, отставленное представление данных видеосюжетов. Первый сюжет «Прыжок с парашютом» был необычен

для большинства испытуемых, студентов университета, в отличие от другого видео – «Лекции в аудитории». Использовали следующие парадигмы: 1) точка фиксации + воображение прыжка, 2) точка фиксации + воображение лекции, 3) точка фиксации + просмотр прыжка, 4) точка фиксации + просмотр лекции, 5) просмотр лекции + просмотр прыжка, 6) просмотр прыжка + припоминание прыжка, 7) просмотр лекции + припоминание лекции, 8) точка фиксации + припоминание прыжка, 9) точка фиксации + припоминание лекции.

Для регистрации использовали магнитно-резонансный томограф Philips Achieva с полем сверхпроводящего магнита 3.0 Тл и мощностью градиентной катушки 80 мТл/м.

Функциональные данные получали с помощью эхо-планарного протокола (TR=3000 мс,

TE=35 мс, матрица 128x128, размер пикселя 1.8x1.8 мм, толщина среза 4 мм, промежуток между срезами 1 мм). В каждой временной серии получали 60 наборов функциональных срезов, покрывающих весь объем головного мозга. Для проведения нормализации и корегистрации использовали индивидуальную изотропную трехмерную модель головного мозга с размером вокселя 1x1x1 мм, построенную с помощью T1-взвешенных анатомических срезов толщиной 1 мм с размером пикселя 1x1 мм.

Индивидуальные данные подвергали нормализации и приводили в единое Тейлор-пространство (Talairach J. et al., 1988). Нормализованный набор данных усредняли с применением программы SPM-8. Модель корковой поверхности подвергали пространственным преобразованиям, позволяющим развернуть

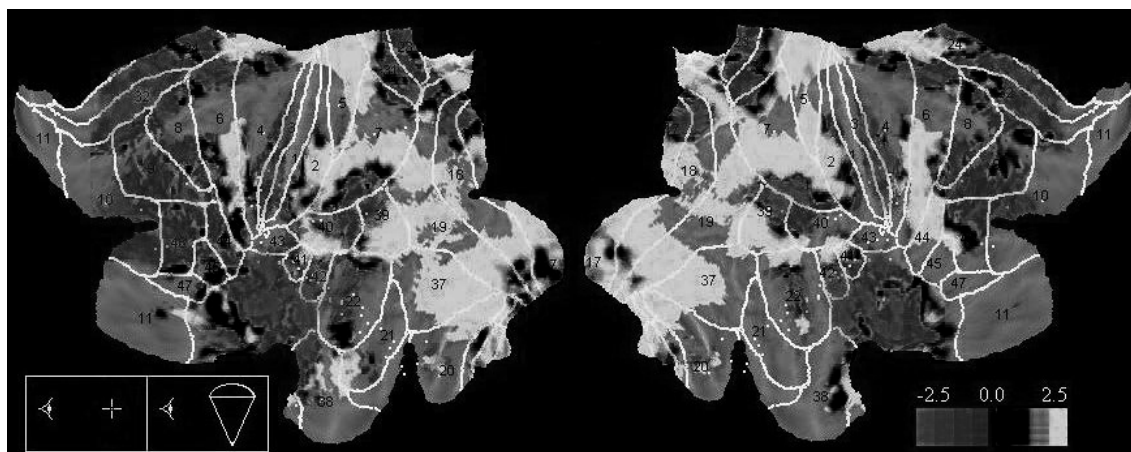


Рис.1 Распределение T-критерия ($-2.5 < T < 2.5$) в коре (плоская проекция) левого и правого полушарий при демонстрации видеосюжета «Прыжок с парашютом» (экспериментальное задание 3). Белыми линиями обозначены границы, а цифрами - номера полей по Бродману.

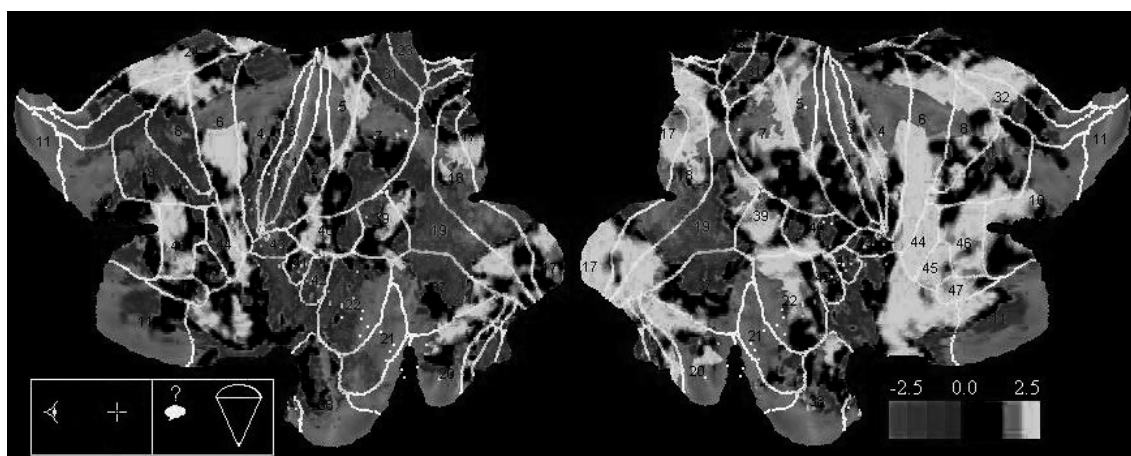


Рис.2 Распределение T-критерия ($-2.5 < T < 2.5$) в коре (плоская проекция) левого и правого полушарий припоминании видеосюжета «Прыжок с парашютом» (экспериментальное задание 8). Обозначения как на рис.1

её на плоскость. На модельную корковую поверхность наносили карты распределения Т-критерия для всех корковых полей правого и левого полушарий мозга. Максимумы значений Т-критерия соответствовали $p < 0.01$ при $n = 21$ (рис. 1,2).

Анализ карт показал достаточную устойчивость активации, как при демонстрации видео, так и попытках вообразить заданные или просмотренные сюжеты в исследуемой группе. При стимуляции преобладала активация в задних отделах коры (рис. 1), а при воображении и припоминании – в передних (рис.2). Реакция первичного 17-го зрительного поля не зависела от содержания сюжета и достоверно была выше для 18-го и 19-го полей при просмотре

необычного и эмоционально окрашенного сюжета «Прыжок с парашютом» (рис. 1). С другой стороны, воображение и припоминание сюжета «Лекция в аудитории», который хорошо знаком испытуемым из их повседневной студенческой жизни, вызывало более значительную активацию префронтальной коры.

Активацию зрительной коры можно было обнаружить при воображении и припоминании, но только в периферических областях ретинопической проекции (рис. 2). Как просмотр, так и припоминание сюжета «Прыжок с парашютом» вызвали отчетливую реакцию 2-го соматосенсорного поля (рис. 1,2), что может свидетельствовать о включении нейронных сетей, содержащих «зеркальные нейроны».

РАННИЕ СТАДИИ ЗРИТЕЛЬНОГО ВОСПРИЯТИЯ ВЕРБАЛЬНОЙ ИНФОРМАЦИИ И ПСИХОПАТОЛОГИЧЕСКАЯ СИМПТОМАТИКА ПРИ ШИЗОФРЕНИИ

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В настоящее время в научной литературе достаточно широко освещена проблема когнитивных нарушений при шизофрении, в том числе с помощью методов вызванных потенциалов (ВП). Нейрокогнитивный дефицит рассматривается как кардинальный признак шизофрении (Bellack A. et al., 1999; Green M. et al., 1999 и др.). Большое внимание уделяется исследованию дефицита переработки вербальной информации при этом заболевании (Kuperberg G.R. et al., 2010; Veelen N.M. J. et al., 2011 и др.). Нарушение передачи информации у больных с позитивной и негативной симптоматикой может найти отражение в разнонаправленных изменениях быстрых ритмов ЭЭГ (Стрелец В.Б. с соавт., 2006). В отношении этих двух групп больных выявлены структурные и нейротрансмиттерные различия (Behrendt R.P., 2003 и др.).

Цель работы – исследование особенностей мозговой переработки зрительно предъявляемой вербальной информации с помощью анализа латентности и амплитуды ранних компонентов ВП у больных шизофренией с преобладанием позитивной и негативной симптоматики.

Методика. Мы исследовали 64 человека, больных шизофренией и расстройствами

шизофренического спектра (категории F20, F21, F25 по МКБ10), с первыми психотическими эпизодами: 32 человека с преобладанием позитивной симптоматики (16 мужчин, 16 женщин, средний возраст – 29.1 ± 7.0 года) и 32 человека с преобладанием негативной симптоматики (16 мужчин, 16 женщин, средний возраст – 25.3 ± 7.4 года). В качестве контрольной группы исследовано 46 здоровых испытуемых (23 мужчины, 23 женщины, средний возраст – 27.6 ± 6.1 года).

Преобладание позитивных или негативных симптомов определялось по шкале PANSS (Positive and Negative Syndrome Scale). Под позитивными симптомами традиционно понимается возбужденное поведение, бред и галлюцинации, под негативными – личностный дефект, эмоциональное уплощение, социальная изоляция.

Вербальные стимулы (слова и псевдослова) предъявляли на экране 14-дюймового монитора на расстоянии 0.75 м от испытуемого, сидящего в кресле перед компьютером в затемненной комнате. Слова и псевдослова предъявлялись в псевдослучайном порядке. Время предъявления – 100 мс. Межстимульный интервал варьировал от 1500 до 4000 мс. Исследовали характеристики ВП при пассивном восприятии стимулов и в условиях, когда слова или псевдослова соответственно были релевантными, то есть при наличии задания. Измеряли латентность и амплитуду компонентов P100 и N170 в нижневисочных (T5, T6), теменных (P3, P4) и затылочных (O1, O2) корковых областях. Проводился анализ поведенческих реакций: время реакции и процент

ошибок. Статистическую обработку полученных показателей проводили с использованием непараметрического критерия Манна-Уитни для межгрупповых сравнений, критерия Вилкоксона для внутригрупповых сравнений, критерия Спирмена для корреляционного анализа показателей ВП и выраженности психопатологической симптоматики.

Результаты и обсуждение. При оценке по шкале PANSS больные шизофренией с преобладанием позитивной и негативной симптоматики достоверно ($p < 0.01$) различались по субшкалам позитивных симптомов (20.3 ± 5.4 и 13.3 ± 3.2 балла соответственно) и негативных симптомов (13.8 ± 5.0 и 17.2 ± 3.4 балла соответственно).

Исследование поведенческих характеристик показало, что время реакции на слова и псевдослова у двух групп больных шизофренией не имело отличий от здоровых испытуемых. Однако процент ошибок у больных с преобладанием позитивной симптоматики при реакции на псевдослова ($p < 0.05$), а у больных с преобладанием негативной симптоматики – при реакции на слова ($p < 0.01$) был больше, чем у здоровых испытуемых. Следовательно, больные с преобладанием позитивной симптоматики больше, чем здоровые, ошибались при инструкции о выборе бессмысленной информации, а с негативной симптоматикой, напротив, – при выборе слов, имеющих смысл.

При пассивном восприятии слов латентность компонента P100 у больных шизофренией с преобладанием позитивной симптоматики была меньше, чем у здоровых испытуемых в левой затылочной области. Латентность N170 в этих же условиях у всех больных шизофренией была значимо меньше, чем у здоровых испытуемых в париетальных областях, а у больных с преобладанием позитивной симптоматики была меньше также в левой затылочной области. У больных с преобладанием негативных симптомов этот показатель, напротив, был меньше, чем у здоровых испытуемых, в правых затылочной и нижневисочной областях. Анализ латентностей компонентов P100 и N170 при пассивном восприятии псевдослов, а также в условиях, когда релевантными были слова, не выявил достоверных межгрупповых различий. В условиях, когда релевантными были псевдослова, латентность компонента N170 у больных с преобладанием позитивной симптоматики была меньше, чем у здоровых испытуемых, в левой теменной

области, а у больных с преобладанием негативной симптоматики – в правой. Следовательно, у больных с преобладанием позитивной симптоматики обнаружено укорочение латентности компонентов ВП преимущественно в восприимчивых областях левого полушария, а с негативной симптоматикой – правого. Известно, что при шизофрении наблюдаются сложности в автоматизированных процессах обработки речевых стимулов (Davalos, 2002, Carrol, 2008), которые и отражают различия в ранних волнах ВП (P100, N170). Strelnikov K. (2010) полагает, что дефицит языковых функций, наблюдающийся при шизофрении, может быть связан с дисфункцией NMDA рецепторов.

Анализ амплитудных характеристик ВП показал, что у больных с преобладанием позитивной симптоматики этот показатель снижен по сравнению со здоровыми испытуемыми лишь в компоненте P100 в условиях пассивного восприятия вербальной информации. Напротив, у больных с преобладанием негативных симптомов наблюдалось снижение амплитудных характеристик компонентов P100 и N170 по сравнению со здоровыми испытуемыми во всех экспериментальных ситуациях. Дефицит амплитуды P100 при обработке визуальной информации относят к эндофенотипу шизофрении (Donohoe G. et. al., 2008 и др.).

Корреляционный анализ характеристик ВП и выраженности психопатологической симптоматики показал, что с временными характеристиками ранних компонентов ВП (P100 и N170) оказались отрицательно корреляционно связаны шкалы позитивных симптомов, в том числе «Бред», «Расстройства мышления». Негативные психопатологические симптомы были отрицательно корреляционно связаны только с амплитудными характеристиками компонента P100.

Заключение. У больных шизофренией с преобладанием позитивной и негативной симптоматики выявлены общие черты и различия дефицита начальной стадии переработки вербальной информации, а также связь этих нарушений с выраженностью психопатологической симптоматики. Позитивные симптомы связаны с укорочением латентности, а негативные – со снижением амплитуды ранних компонентов ВП.

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МОЛЕКУЛЯРНО-ГЕНЕТИЧЕСКИЕ ИССЛЕДОВАНИЯ НЕЙРОФИЗИОЛОГИЧЕСКИХ ПОКАЗАТЕЛЕЙ КОГНИТИВНЫХ ПРОЦЕССОВ У БОЛЬНЫХ ШИЗОФРЕНИЕЙ

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Поиск ассоциаций между генами-кандидатами и характеристиками биоэлектрической активности головного мозга относится к новым, быстро развивающимся областям исследований, направленным на выявление молекулярных основ индивидуальных различий по когнитивным способностям и расширение имеющихся знаний о нейронных сетях, связанных с переработкой информации в головном мозгу. При этом одними из наиболее часто используемых психофизиологических маркеров процессов переработки информации являются параметры волн, связанных с событием вызванных потенциалов (ВП).

Многочисленные исследования показали изменения ВП при шизофрении и аффективных расстройствах, что рассматривается как отражение свойственных этим психическим болезням нейрокогнитивных нарушений. В ряде работ, включая и наши собственные (Лебедева и др. 2009, Голимбет и др. 2010), были выявлены генетические варианты, ассоциированные с теми или иными аномалиями волн ВП. В то же время, нельзя исключить тот факт, что связь между генетическим вариантом и биоэлектрической активностью головного мозга может быть опосредована эмоциональным состоянием больного.

Нами было проведено комплексное мультидисциплинарное исследование, которое включало в себя оценку нейрофизиологических показателей, личностных черт, и определение полиморфизма Val66Met гена мозгового нейротрофического фактора (МНТФ). Выбранный для анализа ассоциаций функциональный полиморфизм Val66Met (rs6265) обусловлен заменой валина на метионин в кодоне 66 белка-предшественника МНТФ. Особый интерес к данному полиморфизму связан с тем, что, как было показано, носители аллеля Met отличаются худшими когнитивными показателями, в частности, вниманием, скоростью обработки информации, рабочей памятью (Ho et al. 2006, Rybakowski et al 2006).

Были обследованы 90 больных шизофренией и шизоаффективным психозом (48 женщин, 42 мужчины, возраст 29.7 (11.3) лет, возраст к началу заболевания 23.5 (6.9) лет), находившиеся на лечении в клинических отделениях НЦПЗ РАМН. Диагноз шизофрении (F20) в соответствии с диагностическими критериями МКБ-10 был поставлен 71 больному, диагноз шизоаффективное расстройство (F25) – 19 больным. Выраженность клинических симптомов (позитивных, негативных, общих психопатологических) оценивали с помощью шкалы PANSS. Все больные на момент обследования принимали различные психотропные препараты. От каждого участника исследования было получено информированное согласие на участие во всех видах обследований. Регистрацию слуховых вызванных потенциалов проводили в стандартной парадигме oddball. Психометрическое исследование предусматривало оценку личностной тревожности по опроснику Спилбергера-Ханина. Молекулярно-генетическое исследование включало в себя отбор венозной крови больных, выделение из нее ДНК и генотипирование с использованием полимеразной цепной реакции. При статистической обработке данных использовали обобщенную линейную модель многомерного ковариационного анализа. На первом этапе в качестве зависимой переменной рассматривали композитный индекс, включающий латентности или амплитуды волн во всех отведениях, а независимыми факторами служили генотипы (ValVal или Met, т.е. генотипы, содержащие 1 или 2 копии этого аллеля) и уровни тревожности (выше или ниже средних значений, определенных для московской популяции). В качестве ковариат в модель вводили пол, возраст и выраженность клинических симптомов.

Был обнаружен значимый ($p=0.002$) эффект взаимодействия двух переменных – аллельного варианта полиморфизма Val66Met и уровня тревожности – на амплитуду волны N100 в теменной области (композитный индекс, включающий отведения P3, Pz, P4). На уровне тенденции эффект этого взаимодействия наблюдался в центральной области ($p=0.06$). Непосредственного влияния самого генотипа МНТФ или тревожности на независимую переменную обнаружено не было. Пол и возраст не оказывали опосредующего влияния на зависимость между генотипом, уровнем тревожности и амплитудой

волны N100. Post-hoc анализ показал, что в группе с высоким уровнем тревожности (выше 42 баллов), которая включала в себя 56 человек, значения амплитуд волны N100 не зависели от наличия варианта ValVal или Met гена MHTF. В группе с низким уровнем тревожности (42 балла и ниже) были обнаружены значимые различия: у носителей варианта Met амплитуда волны была значимо ниже во всех отведениях по сравнению с носителями варианта ValVal ($p=0.01-0.03$ в зависимости от отведения). В то же время был обнаружен значимый эффект ($p=0.02$) позитивной симптоматики на величину амплитуды N100. Наибольшая выраженность позитивных симптомов (бред, галлюцинации) была выявлена именно у носителей аллеля Met в группе с низким уровнем тревожности.

Полученные результаты указывают на то, что генетический вариант MHTF связан с нейрофизиологическими процессами неспецифической активации внимания у больных шизофренией, причем эта связь опосредована особенностями личности больных, в частности, тревожностью и их клиническим состоянием.

НЕЙРОФИЗИОЛОГИЧЕСКИЕ КОРРЕЛЯТЫ ЭМОЦИОНАЛЬНЫХ РАССТРОЙСТВ И НАРУШЕНИЙ МОТОРНЫХ И КОГНИТИВНЫХ ФУНКЦИЙ ПРИ ДЕПРЕССИИ

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Депрессия – это тяжелое системное заболевание, которое широко распространено в населении (до 17%) и проявляется не только эмоциональными расстройствами, но и нарушениями двигательных и ряда когнитивных функций, что имеет неблагоприятные социально-экономические и психологические последствия в виде ухудшения работоспособности и социальной адаптации пациентов. В связи с высокой актуальностью медико-социальных проблем депрессии во всем мире ведутся интенсивные медико-биологические исследования мозговых механизмов этого заболевания.

Целью настоящей работы было выявление нейрофизиологических коррелятов изменений эмоционального состояния и некоторых когнитивных функций в динамике терапии эндогенной депрессии.

Работа выполнена при частичной поддержке грантом РГНФ № 12-06-00961.

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Rybakowski J. K., Borkowska A., Skibinska M., Szczepankiewicz A., Kapelski P., Leszczynska-Rodziewicz A., Czerski PM, Hauser J. 2006. Prefrontal cognition in schizophrenia and bipolar illness in relation to Val66Met polymorphism of the brain-derived neurotrophic factor gene. *Psychiatry Clin Neurosci* 60 (1), 70–76.

В исследование, которое проводилось с соблюдением современных норм биомедицинской этики, было включено 53 больных с диагнозом: депрессивное состояние в рамках рекуррентной депрессии (F33.1, по Международной классификации болезней — МКБ-10) или депрессивной фазы биполярного аффективного расстройства (F31.3, по МКБ-10). Группы включали 22 пациента (9 женщин, 12 мужчин) молодого и среднего возраста (от 20 лет до 51 года, средний возраст 36.4 ± 2.5 лет) и 31 пациента (25 женщин, 6 мужчин) пожилого возраста (от 53 до 72 лет, средний возраст 68.0 ± 6.0 лет). Для количественной оценки тяжести депрессии и ее изменений в динамике терапии использовались клинические шкалы: Гамильтона для депрессии (HDRS-17 и HDRS-21) и общего клинического впечатления (CGI-S и CGI-I).

Двукратное (перед началом лечения и в конце курса терапии при отчетливом улучшении клинического состояния на фоне продолжения приема антидепрессантов) нейрофизиологическое обследование включало многоканальную регистрацию (по системе 10–20%) и узкополосный анализ спектральной мощности (СпМ)

ЭЭГ (в полосе 2.0–30.0 Гц с шагом 1.0 Гц), усреднение когнитивных вызванных потенциалов на слуховые стимулы (тоны 70 дБ, 50 мс, 1000 и 2000 Гц) в парадигме направленного внимания (*odd ball*) с анализом пиковой латентности (ЛП) «поздних» компонентов (P_2 , N_2 и P_3), а также измерение ЛП простой сенсомоторной реакции и сенсомоторной реакции выбора, которое проводилось параллельно с усреднением когнитивных вызванных потенциалов. Для статистической обработки данных использовали программы непараметрической статистики «STATISTIKA для Windows, v.6.0».

До начала терапии значения тяжести депрессии у больных среднего возраста варьировали от 20 до 37 баллов по шкале *HDRS-21* (в среднем по группе 25.0 баллов), у пациентов пожилого возраста они составляли от 16 до 30 баллов по шкале *HDRS-17* (в среднем по группе 24.1 балла). В конце курса лечения у пациентов обеих возрастных групп отмечено выраженное улучшение клинического состояния: у больных среднего возраста средний балл шкалы *HDRS-21* составил 4.2 балла, у больных пожилого возраста средний балл шкалы *HDRS-17* составил 6.0 баллов.

Улучшение эмоционального статуса пациентов под действием терапии ассоциировалось с сокращением пиковых ЛП «поздних» компонентов когнитивных вызванных потенциалов. В группе больных пожилого возраста среднее значение пикового ЛП компонента P_2 достоверно (на уровне $p < 0.05$, по W -критерию Уилкоксона) уменьшилось на 15 мс, ЛП компонента N_2 — на 32 мс ($p < 0.01$), а ЛП компонента P_3 — на 42 мс ($p < 0.01$). В группе пациентов среднего возраста среднее значение пикового ЛП компонента P_3 высокодостоверно ($p < 0.001$) уменьшилось на 40 мс. Это свидетельствует об ускорении когнитивных процессов дифференцирования слуховых стимулов, принятия решения и организации ответной моторной реакции, что нашло подтверждение при анализе динамики ЛП сенсомоторных реакций. В группе пожилых больных достоверно сократились ЛП простой сенсомоторной реакции (на 41 мс, $p < 0.01$) и реакции выбора (на 55 мс, $p < 0.01$), в группе пациентов среднего возраста ЛП простой сенсомоторной реакции достоверно уменьшился на 46 мс ($p < 0.05$), а ЛП реакции выбора — на 41 мс ($p < 0.05$).

Улучшение клинического состояния пациентов и ускорение моторики и когнитивных процессов ассоциировались со сложной реорганизацией пространственно-частотной структуры ЭЭГ. В теменно-затылочных отведениях отмечены ЭЭГ-признаки улучшения функционального

состояния задних отделов коры головного мозга в виде достоверного ($p < 0.05$) увеличения СпМ альфа-2 (9–11 Гц) и альфа-3 (11–13 Гц) поддиапазонов. В лобных, центральных и средневисочных отведениях достоверно ($p < 0.05$) возросла СпМ медленноволновой ЭЭГ-активности дельта (2–4 Гц) и тета-1 (4–6 Гц) поддиапазонов, что отражает усиление тормозных процессов в этих корковых зонах, более выраженное в правом полушарии. Кроме того, в большинстве отведений (особенно в левой лобной области) достоверно ($p < 0.05$) увеличилась СпМ бета-1 (13–20 Гц) и бета-2 (20–30 Гц) активности, что отражает повышение активации коры со стороны ретикулярных структур ствола мозга. Напротив, в височных областях, тесно связанных с эмоциональными лимбическими структурами, неоднозначно проявились ЭЭГ-признаки усиления тормозных процессов (в виде повышения СпМ медленноволновой ЭЭГ-активности) и ослабления активации (в виде снижения СпМ бета-активности), причем эти изменения также сильнее были выражены в правом полушарии.

Корреляционный анализ (ранговая корреляция по Спирмену) клинических и ЭЭГ данных показал, что независимо от возраста пациентов степень выраженности депрессии до начала терапии ассоциировалась со сниженным функциональным состоянием передних отделов левого полушария и повышенной активацией правого полушария (особенно височных областей), а клиническое улучшение оказалось связанным с усилением тормозных процессов в правом полушарии (особенно в его лобно-центрально-височных зонах) и с активацией лобных областей левого полушария.

Результаты исследования согласуются с представлениями о роли передних отделов левого полушария в регуляции положительных, а правого полушария — в регуляции отрицательных эмоций (Flor-Henry, 1983; Стрелец и др., 1990; Thibodeau et al., 2006) и подтверждают, что состояние депрессии ведет к снижению работоспособности за счет замедления как центральных процессов переработки информации и принятия решения, так и собственно моторных реакций.

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НЕКОТОРАЯ СТРУКТУРНАЯ И ФУНКЦИОНАЛЬНАЯ ПАТОЛОГИЯ ГОЛОВНОГО МОЗГА НА РАННИХ ЭТАПАХ ЮНОШЕСКОЙ ШИЗОФРЕНИИ

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Известно, что нейрокognитивный фактор является одним из основных в патогенезе шизофрении. Как следствие, установление мозговых механизмов когнитивных расстройств становится ключевым шагом к пониманию природы заболевания, разработке новых методов его прогноза и лечения.

Очевидным и наиболее информативным подходом здесь являются мультиметодические исследования, объединяющие методы нейровизуализации (с высоким пространственным разрешением) и методы нейро- и психофизиологии (с высоким временным разрешением).

В настоящей работе были обследованы выборка больных юношеской шизофренией (17–28 лет), находящихся на этапе становления ремиссии и в ремиссии, и подобранная по возрасту и полу группа психически здоровых людей. Методы протонной МР-спектроскопии,

диффузионно-тензорной МРТ были реализованы на 3T Philips Achieva томографе (Голландия), регистрацию ЭЭГ и слуховых ВП в парадигме oddball – на аппаратно-программном комплексе топографического картирования биопотенциалов мозга (NeuroKM, НМФ «Статокин», Россия) в комплексе с аудиогенератором (МБН, Россия).

Результаты указывают на определенные взаимосвязи между метаболическими отклонениями в ряде областей головного мозга (надкраевая извилина левого и правого полушария) и процессами обработки слуховой информации. Была также выявлена связь между микроструктурными нарушениями колена мозолистого тела и нарушением синхронизации биоэлектрической активности в диапазоне, ассоциируемом с поддержанием рабочей памяти и оценкой значимости поступающей информации.

В то же время, роль дорсолатеральной префронтальной коры в патологических процессах на ранних этапах юношеской шизофрении оказалась неожиданно мала, что может быть связано с особенностями нейробиологических процессов в этой относительно гомогенной группе больных молодого возраста, с короткой длительностью заболевания и с хорошим клиническим исходом.

НАРУШЕНИЕ НЕЙРОФИЗИОЛОГИЧЕСКИХ МЕХАНИЗМОВ ЦЕЛОСТНОГО ЗРИТЕЛЬНОГО ВОСПРИЯТИЯ У ДЕТЕЙ С АУТИЗМОМ

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На сегодняшний день основанием для постановки диагноза «детский аутизм» является наличие у ребенка триады поведенческих симптомов: искажение вербальной и невербальной

коммуникации, трудности социализации и стереотипизация поведения (DSM-IV; МКБ-10). Характерные для большинства детей с синдромом аутизма нарушения базовых процессов восприятия не рассматриваются в качестве диагностического критерия. Однако в последнее время становится все более обоснованным предположение о том, что эти нарушения могут играть значительную роль в формировании аутистического фенотипа (Gerrard and Rugg, 2009). Одно из наиболее известных нарушений – выраженный фрагментарный характер зрительного восприятия, который приводит к формированию причудливого профиля дефицитарных и опережающих зрительных способностей у детей с синдромом аутизма (СА) по сравнению типично развивающимися (ТР) сверстниками (Grinter et al., 2010; Bertone et al., 2005; Чухотова и др., 2011).

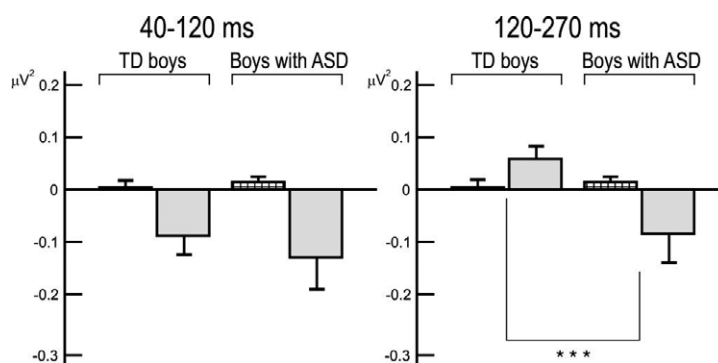


Рисунок 2. Различия в выраженности двух фаз «эффекта иллюзии» в объединенных затылочных и теменных отведениях между детьми с типичным развитием и детьми с синдромом аутизма. Слева: величина эффекта иллюзии в период 40–120 мс; справа: величина эффекта иллюзии в период 120–170 мс. Столбцами обозначена разница в мощности ФС гамма-осцилляций в ответ на иллюзорное и контрольное изображения (положительные значения соответствуют более мощному ответу при обработке иллюзии Канизы, отрицательные – при обработке контрольного изображения). Заштрихованные столбцы соответствуют предстимульному временному интервалу, серые столбцы – постстимульным временным интервалам. Звёздочками отмечены статистически значимые изменения величины «эффекта иллюзии» (полученные при помощи непараметрического критерия Вилкоксона): *** $P < 0,0005$.

Для исследования нейрофизиологических механизмов этого нарушения мы воспользовались широко известной моделью иллюзорного квадрата Канизы (Kanizsa, 1976). Основной характеристикой при использовании данной модели является «эффект иллюзии» (ЭИ) – величина различий одного и того же параметра вызванного ответа мозга на предъявлении иллюзорного и контрольного изображения (рис.1). В

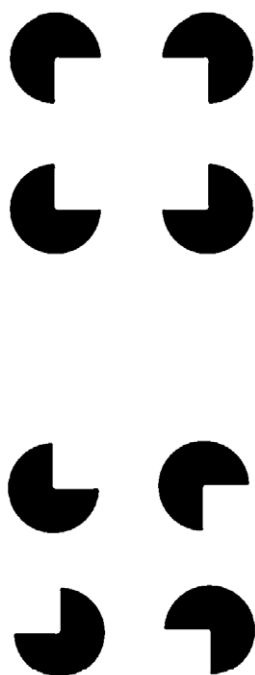


Рисунок 1.
Экспериментальный
(верхний)
и контрольный
(нижний) стимулы

предыдущей работе были показаны качественные различия в ЭИ на амплитуду компонента N1 зрительного вызванного потенциала между ТР детьми и детьми с СА (Stroganova et al., 2007). Целью настоящей работы стало исследование ЭИ в динамике вызванной высокочастотной бета/гамма активности.

В исследовании приняли участие 40 детей 3–8 лет: 20 детей с СА и подобранные им по принципу парного соответствия хронологического возраста ТР дети. Диагноз «аутизм» был подтвержден опытным психиатром на основании соответствия критериям DSM-IV и МКБ-10, а также клиническим психологом с помощью методики CARS (Children Autism Rating Scale; Schopler et al., 1986). Испытуемым в случайном порядке предъявляли «квадрат Канизы» и контрольное изображение размером 9 угловых градусов. Далее оценивали вызванный ответ мозга в высокочастотной полосе частот (15–60 Гц), жестко привязанный по фазе к началу подачи стимула. Результаты показали, что в обеих группах детей ранняя фаза (40–120 мс) ЭИ проявлялась в блокаде гамма синхронизации в срединных затылочных зонах скальпа при предъявлении иллюзорного контура. У здоровых детей за этой ранней фазой следовала вторая (120–270 мс), для которой было характерно, напротив, общее для затылочных и теменных отведений усиление гамма активности в ответ на предъявление иллюзорного контура. Однако у детей с СА эту фазу отсутствовала. В

этой группе детей ЭИ проявлялся в большем подавлении гамма-ответа на иллюзорный контур на протяжении 300–400 мс после подачи стимула. Феномен раннего подавления нейронной активности первичной зрительной коры при восприятии иллюзорного контура (первый ЭИ) рассматривают как низкоуровневый процесс, призванный передать сигнал об имеющихся разрывах в непрерывном контуре в следующие уровни зрительной иерархии (Ramsden et al., 2001). В то же время более поздний – прямой ЭИ отражает до-сознательный процесс перцептивной группировки элементов изображения за счет обратного сигнала от высших зрительных зон по нисходящим проекциям к первичной

зрительной коре об избирательном усилении активности нейронов, чьи рецептивные поля пересекают иллюзорную линию (Sary et al., 2008). В этот момент происходит заполнение разрывов в иллюзорном контуре, т.е. перцептивная группировка его фрагментов.

Мы предполагаем, что при аутизме распознавание зрительного паттерна преимущественно опирается на низкоуровневые внутренние механизмы первичной зрительной коры при резко ослабленном сигнале обратной связи от высших зон потока обработки зрительной информации.

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SPECIAL FEATURES OF INDEPENDENT COMPONENTS FOR EVENT-RELATED POTENTIALS FROM SCHIZOPHRENICS AND PATIENTS WITH OBSESSIVE-COMPULSIVE DISORDER

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Symptoms of different psychiatric disorders such as impairments in attention, the ability to plan, initiate and regulate goal directed behavior point on disturbances in the executive system. These distortions are the core of schizophrenia despite of the fact that psychosis is the most prominent manifestation of this disorder (Kropotov J.D., 2008). Patients with obsessive-compulsive disorder (OCD) suffer from recurrent, unwanted thoughts (obsessions) and/or repetitive behaviors (compulsions). Repetitive behaviors such as handwashing, counting, checking, or cleaning are often performed with the hope of preventing obsessive thoughts or making them go away (Ling B.E., 2005). These symptoms also point on disturbances in action control system in particular action suppression processes.

The three stimulus oddball paradigm that includes standard, deviant and novel stimuli is traditionally used to study functioning and dysfunctioning of the executive system. In our study we used two stimulus active test of Go-NoGo paradigm. The essence of the test is in accident and equally probable presentation of stimuli for two categories. One category of stimuli (Go stimuli)

expects subject's reaction (pressing button), the other (NoGo stimuli) demands to inhibit prepared action. Under such instruction participant forms action model according to that he or she will react in case of presentation of Go stimuli. In this study such model was pressing button after two pictures of animal presented in pair. In case of NoGo probes the second stimulus in pair was picture of plant. These stimuli differ from model so first it cause disparity in sensory areas of the cortex. Then it cause disparity in the frontal areas of the cortex because of comparing between necessary action (do not press button) and planned action (press button). Thus, this paradigm allows discovering electrophysiological correlates of such processes like action involvement, action suppression and action monitoring which are the main processes of executive system.

ERPs like EEG are complex signal containing activity from many sources. Independent Component Analysis (ICA) was developed in 90s (Bell A.J., Sejnowski T.J., 1995) and now it is the most effective method for Blind Source Separation of complex signal. This separation allows determining signal source's localization quite well.

The aim of our study was to determine differences of independent components of event-related potentials from schizophrenics and patients with obsessive-compulsive disorder in active two-stimuli Go-NoGo test compare to control group.

Methods Subjects were 30 schizophrenics free of any medication with a drug in age from 19 to 36 years old and 9 patients with OCD in age from 21 to 39 years old. Test consisted of 400 probes,

probes were pairs of visual stimuli: animal-animal (probe Go), animal-plant (probe NoGo), plant-plant (Ignore) and plant-human (Novel). Probes were presented in random order with probability of 25%. Probe Novel was accompanied by sound. Participants were instructed to press the button as quickly as possible after Go probes (animal-animal) and don't press after other types of stimuli. EEG was recorded by 19-channel Electrocap with electrodes attached according to 10–20 system. Button signal was registered to control the reaction time and the amount of mistakes during test execution. EEG was processed using common average montage. Separating of independent components was performed by INFOMAX algorithm (Makeig S. et al., 2004) automatically in WinEEG. Spatial filters were constructed using the database (249 healthy subjects of age from 18 to 40) and were used to separate eight independent components with the greatest amplitude. Independent components were averaged separately by groups of schizophrenics, patients with OCD and healthy subjects (223 participants in age from 18 to 36 years). Statistical analysis was performed using Manna-Whitney U-test for independent groups. Independent components' topographies were determined by means of sLORETA (Pascual-Marqui R., 2002).

Results Behavioral data analysis concludes that schizophrenics made more omission mistakes compare to healthy subjects and had significantly greater standard deviation of reaction time. Analysis of ERPs from probe Go revealed that amplitude of component with latency around 300 ms which is generated in parietal area and is possibly connected with action involvement, significantly decreased in group of schizophrenics. Amplitude of independent component picked out from ERPs in probe Novel was also diminished in group of patients. This component is thought to be connected with novelty reaction. Analysis for independent components of ERPs from probe NoGo revealed that schizophrenics had significantly smaller

amplitude of component with latency around 400 ms which is generated in anterior cingulate cortex and is likely connected with action monitoring and component with latency around 300 ms of ERPs which is generated in premotor area and is likely connected with action inhibition. The only one independent component had greater amplitude in group. This component of ERPs from probe NoGo is generated in left posterior temporal area. These differences might indicate decrease in activity of frontal and parietal areas in schizophrenics which in turn might be connected with disturbances in executive system.

Patients with OCD had significantly smaller amplitude only of two components generated in premotor area. The first one is generated on the second stimulus in the probe Novel and possibly reflects novelty reaction. The other has latency around 300 ms generated in the NoGo probes and possibly connected with action suppression. These findings point on lower activity of the neurons in premotor cortex.

The similar amplitude changes were observed during individual data analysis. This observation supports the possibility of using these methods for early diagnostics of schizophrenia and obsessive-compulsive disorder.

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SHORTENED TEMPORAL PROCESSING OF VERBAL STIMULI IN THE PATIENTS WITH SCHIZOPHRENIA CONSTRUCTS THE BASIS OF THEIR COGNITIVE DISFUNCTION

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Introduction.

The inner mental events need some time to be manifested at the external level;

this time according James should not be shorter than 100 ms. This study is aimed at the early coding of visually presented verbal material – words and non-words in norm and patients with the first episode of schizophrenia having positive symptoms in the implicit (passive perception) and explicit (following instructions) situations.

Methods.

The latencies and the amplitudes of early EP components P100 и N170 in posterior areas P1, P2, O1, O2 were studied in the group of schizophrenic patients and the group of healthy subjects, each group included 50 subjects, giving informed consent for the experiments. Each subject received 40 words and 40 non-words presented in random order. In the first series the stimuli were presented in passive condition, in the second and third ones – they had to push the button to words or non-words, correspondingly.

Results.

Components P100 and N170 in the studied areas in patients had shorter latency than in the control group in all situations. This decrease was statistically

significant. The amplitude of N170 component was in norm larger to significant (words) and relevant (pushing the button) stimuli, while in patients, on the contrary, it was larger to non-significant and irrelevant stimuli.

Discussion.

Thus, the time of informational processing in schizophrenic patients was less than 100 ms and, according to James, such short mental event can't be adequate for such event to be manifested at the external (psychic) level. Pathological attenuation of the processing time of early stages of perception results in the disturbances at the subsequent stages of informational processing, these disturbances lead to the amplitude decrease of P300 component in comparison with the norm even during passive perception (implicit situation). In the explicit situation – where the subject had to detect words from non-words or relative words from irrelative ones the amplitude of component N170 in schizophrenia is inversed in comparison with the norm. Amplitude of N170 was smaller for significant stimuli (words) and irrelative ones. We suppose, that in schizophrenic patients with positive symptoms there is the disturbance of neural mechanisms responsible for early temporal informational processing. The immature material is inadequate for mental activity in schizophrenic patients and this constructs the basis for manifestation of the first episode schizophrenia with positive symptoms.

Воркшоп «Принятие решений» / Workshop “Decision making”

Ведущие: Ирина Григорьевна Скотникова,
Юрий Евгеньевич Шелепин
Chair: Irina Skotnikova, Jurij Shelepin

ЛИЧНОСТНЫЕ И ПРОФЕССИОНАЛЬНЫЕ ДЕТЕРМИНАНТЫ ПРИНЯТИЯ РЕШЕНИЙ

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В современной науке о решениях (decision science) все больше внимания уделяется психологическим и социальным детерминантам когнитивных процессов (Величковский, 2006: 257–268). Целью данного исследования было выявление индивидуальных стратегий, обеспечивающих успешность принятия решений (ПР). Предполагалось, что профессиональный опыт ПР в условиях риска и неопределенности способствует формированию более эффективных и, возможно, особо организованных стратегий. Для проверки этой гипотезы было проведено сравнение особенностей ПР у банковских брокеров и рядовых менеджеров банка. Первые являются постоянными игроками на биржах, покупают и продают, рискуя деньгами банка и своим финансовым благополучием. Вторые гораздо реже принимают финансовые решения и практически не идут

на риск в ходе выполнения своих профессиональных обязанностей. Для выявления особенностей ПР были собраны задачи, используемые в различных исследованиях, проведенных Д. Канеманом, П. Словиком, А. Тверски (2005) и их коллегами. Эти задачи могут быть решены с использованием основных формул теории вероятности и рациональных эвристик (стратегий или совокупности приемов принятия решений, опирающихся на математическую логику, реализующихся осознанно через последовательное применение формальных процедур). Однако формулировки задач провоцируют обращение к так называемым житейским эвристикам (опирающимся на повседневный опыт, реализующимся неосознанно (интуитивно) через стихийное применение ряда правил). Об этом свойстве «эвристических задач» критически отзывался Г. Гигеренцер (Gigerenzer, 2001). Также предполагалось, что успешность в принятии решений детерминируется рядом личностных характеристик, таких, как уровень интеллекта, способы обработки информации («когнитивные стили»), а также некоторыми характеристиками эмоциональной сферы.

Методика

Испытуемые. В исследовании в качестве экспериментальной группы приняли участие 29 банковских брокеров, по роду своей деятельности вынужденные принимать финансовые решения в условиях повышенного риска и неопределенности. Также была создана контрольная группа, полностью соответствующая экспериментальной по количеству, возрасту, полу, стажу работы испытуемых; в нее вошли рядовые менеджеры банков. Возраст участников варьировался от 22 до 40 лет (средний возраст 29,2).

Процедура: Тестирование проводилось индивидуально с использованием компьютеризированных методик.

Используемые задачи: подборка из 12 задач на выявление эвристик, используемых для принятия решений. Задачи предъявлялись на компьютере с регистрацией типа и латентного времени ответа.

Используемые психодиагностические методики: сокращенный вариант теста Амтхауэра, определяющий структуру интеллекта; методики, направленные на выявление когнитивных стилей: тест Струппа на гибкий-ригидный когнитивный контроль; методика Готтшальдта на полнезависимость-полнезависимость; методика Кагана на импульсивность-рефлексивность; опросники, направленные на выявление личностной тревожности и склонности к «типу А» поведения.

Результаты и обсуждение

Первый этап анализа данных был посвящен сравнению стратегий ПР в экспериментальной и контрольной группах. Для проведения второго этапа анализа общая выборка с помощью взвешенной экспертной оценки была разделена на три небольшие подгруппы («звезды» (7 человек); «опытные профессионалы» (13 человек); «новички» (9 человек)), которые сравнивались между собой.

Решая вероятностные задачи, банковские брокеры чаще опирались на рациональные эвристики в выборе ответов по сравнению с участниками контрольной группы ($p=0,02$). Кроме этого, было установлено, что они обладают более высоким уровнем математического и вербального интеллекта, также более выраженной рефлексивностью, гибкостью и полнезависимостью. В проявлениях личностной тревожности и склонности к «типу А» поведения не было найдено значимых различий между контрольной и экспериментальными группами.

Также было показано, что три группы брокеров значимо отличались по успешности ($p = 0,033$) и времени решения ($p = 0,003$) вероятностных задач, а также по ряду личностных

характеристик. Регрессионный анализ выявил вклад различных индивидуальных свойств в успешность решения вероятностных задач: $0,478a + 0,515b + 0,284c + 0,228d + 0,046e$, где a – математический интеллект, b – склонность к «типу А» поведения, c – полнезависимость, d – рефлексивность, e – гибкий когнитивный контроль.

Наиболее интересным результатом было выявление особой «надситуативной стратегии» принятия решений. Было установлено, что брокеры-звезды, превосходя всех остальных участников по частоте применения рациональных эвристик и уровню математического интеллекта, затрачивают слишком много времени при решении любых задач (как задач на определение вероятности событий, так и задач на выявление уровня интеллекта и выраженности когнитивных стилей). Это можно было интерпретировать только как применение ими особой сверхрефлексивной стратегии, опирающейся на сознательное управление решением задач с перепроверкой принятых решений. Эта стратегия позволяет брокерам в меньшей степени зависеть от внешних параметров ситуации.

Заключение

Проведенное исследование позволило установить различия в стратегиях принятия решений, детерминированные профессиональным опытом и личностными факторами. Были показаны значимые различия между профессиональными брокерами и рядовыми сотрудниками банков, а также между более и менее успешными брокерами в решении «эвристических задач». Это свидетельствует о том, что сами задачи имеют высокую прогностическую силу и могут быть использованы для выявления типа используемой эвристики. Была описана особая «надситуативная» стратегия в принятии решений, проявляющееся в сверхрефлексивном подходе к процессу анализа задач, характеризующимся использованием рациональных стратегий и высокими временными затратами.

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К ВОПРОСУ О ВЗАИМОСВЯЗИ РЕФЛЕКСИИ И ПРОЦЕССОВ ПРИНЯТИЯ РЕШЕНИЯ

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Рефлексия и принятие решения являются двумя процессами, во многом противоположными и даже антагонистическими по своей функциональной направленности. Принятие решения (ПР) – это процесс, предполагающий непосредственный «выход» на организацию и реализацию поведения и деятельности. И в этом смысле он представляет собой действенно- и деятельностно-ориентированный процесс. Рефлексия же, наоборот, по самой своей сути предполагает и даже требует «приостановки», паузы в поведенческом и деятельностном континууме. Она – активна, но не действенна. Понятно, что такого рода противоположность обусловлена функциональной специализацией указанных процессов (Metcalf, 2008). Вместе с тем, эти два процесса обладают и глубинной общностью своей психологической природы, а потому – взаимодополняют и взаимопологают друг друга. Действительно, рефлексия как процесс (и рефлексивность как свойство) особенно необходимы во всех тех ситуациях, организация поведения в которых сопряжена с выбором, с неопределенностью и необходимостью ее преодоления. «Рефлексивная пауза» нигде так не важна, а рефлексивные процессы и механизмы нигде не являются столь значимыми, как в этих «точках разрыва поведенческого континуума». Тем самым процессы ПР объективно предполагают актуализацию рефлексивных процессов и в значительной мере состоят в них. Фаза так называемой «информационной подготовки» решений в традиционных схемах описания этого процесса во многом тождественна «внутреннему сканированию» – поиску, то есть, по существу, процессу рефлексии.

Руководствуясь этими положениями, мы провели специальный цикл исследований, направленный на экспериментальное изучение взаимосвязи индивидуальной меры развития рефлексии и результативных параметров процессов ПР. Для диагностики меры рефлексивности применялась разработанная нами ранее специальная методика (Карпов, 2003). В качестве экспериментальных моделей для определения индивидуальных различий в результативных параметрах процессов ПР были использованы также разработанные нами методики «Концерн»

и «Выбор». Подробное описание этих методик, а также других – аналогичных им экспериментальных компьютерных моделей приведено, например, в (Карпов, 1998). В экспериментах приняли участие 220 испытуемых в возрасте от 18 до 47 лет, обоего пола.

В результате проведения экспериментов были установлены следующие основные зависимости между двумя изучаемыми переменными.

Во-первых, между ними отсутствует какая-либо *прямая*, однозначная зависимость. Эта связь носит существенно более сложный характер, приближаясь к *инвертированной «U-образной»* зависимости. Подобный тип зависимости уже был неоднократно выявлен нами по отношению к связи параметра рефлексивности и ряда иных деятельностных характеристик. В частности, такого рода зависимость была рассмотрена выше в отношении связи индивидуальной меры рефлексивности и эффективности управленческой деятельности (Карпов, 1998). Для такого рода зависимостей в общем плане характерно наличие двух областей минимальных значений зависимой переменной (в нашем случае – качественных параметров ПР). Они соотносятся, соответственно, с минимальным и с максимальным значением независимой переменной (в нашем случае – степенью рефлексивности). Одновременно для них же характерна точка (точнее – интервал) максимума значений зависимой переменной, соотносящаяся с некоторыми промежуточными – средними величинами независимой переменной. Это вскрывает принадлежность такого рода зависимости к так называемым зависимостям «типа оптимума».

Общий смысл обнаруженной зависимости состоит в том, что максимальное качество процессов ПР имеет место не при минимальной рефлексивности (что вполне естественно и понятно), но и не при максимальном ее значении (что уже менее очевидно с априорной точки зрения). Оно максимально на некотором промежуточном, хотя и достаточно высоком значении рефлексивности. Эту же зависимость можно интерпретировать несколько иначе. Первоначальный рост рефлексивности приводит к существенному возрастанию качественных параметров процессов ПР. Затем, однако, прямая зависимость между ними достигает определенного предела: она вначале перестает действовать в этой своей прямой форме, а затем трансформируется в обратную зависимость. Эта и другие, полученные ранее, аналогичные зависимости показывают,

что, по-видимому, существует некоторая зона, интервал оптимальных значений рефлексивности, при котором значения «внешнего критерия» (эффективности деятельности, качества ПР и др.) являются максимальными. Сдвиги, как в сторону уменьшения, так и в сторону увеличения рефлексивности ведут к снижению значений «внешнего критерия».

Во-вторых, *величина разброса* значений зависимой переменной (качества ПР) не остается постоянной на всем континууме значений независимой переменной – индивидуальной меры рефлексивности. Разброс значений возрастает пропорционально возрастанию самой независимой переменной. Другими словами, увеличение степени рефлексивности одновременно приводит и к возрастанию *степени вариативности* ее взаимосвязи с качественными параметрами процесса ПР. Чем выше рефлексивность, тем больше вариативность ее связи с качественными – результативными показателями ПР как таковыми (то есть своеобразная «свобода» этой связи). Складывается ситуация, при которой возрастание рефлексивности как бы нивелирует, «смазывает» зависимость от нее качественных параметров ПР (хотя в общем виде эта зависимость сохраняется). Есть основания думать, что данный результат объясняется тем, что возрастание меры рефлексивности приводит к усилению влияния на изучаемую зависимость ряда иных – «сцепленных» с рефлексивностью параметров (например, нейротизма, флексibilityности, эмпатичности, когнитивной сложности и др.). Их влияние на зависимую переменную – качество ПР достаточно сложно и неоднозначно, что и

проявляется в диверсифицированности рассматриваемой здесь зависимости. Рефлексивность, наряду с тем, что сама влияет на качество процессов ПР, изменяет и, в основном, *повышает меру сензитивности* субъекта к влиянию на процессы ПР многих иных – и субъектных, и объектных факторов.

Таким образом, обнаруженная зависимость имеет как бы две основные стороны, обладает двойным смыслом. С одной стороны, она существует «сама по себе» и принадлежит ко вполне определенному виду зависимостей – к зависимостям «типа оптимума». С другой стороны, на эту зависимость накладывается и взаимодействует с ней другая зависимость. Это – закономерная связь степени ее выраженности с индивидуальной мерой рефлексивности. Рефлексивность как таковая, выступая «аргументом» в функциональной зависимости от нее качественных параметров ПР, одновременно является и детерминантой диверсифицированности этой зависимости. Возникает своего рода «зависимость второго порядка» – метазависимость, накладывающаяся на основную («первичную») и повышающая меру ее диверсифицированности.

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ЭВРИСТИЧНОСТЬ МЕТОДА СТРУКТУРНОГО МОДЕЛИРОВАНИЯ НА ПРИМЕРЕ ПСИХОЛОГИЧЕСКОЙ РЕГУЛЯЦИИ ЛИЧНОСТНОГО ВЫБОРА

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Современные статистические методы обработки и анализа данных позволяют проверять все более сложные гипотезы, выявляя асимметричные взаимовлияния переменных. С их помощью решается не только проблема учета ненормальности распределения, но и снимается требование использовать только параметрические шкалы (см. работы Cohen, Chien-Ho Wu). Для установления влияний личностных переменных на регуляцию выборов и решений

человека это особенно важно, поскольку субъектные переменные нельзя понимать в качестве собственно воздействий, но их взаимосвязи могут быть оценены именно в их регулятивных аспектах.

Метод структурного моделирования, ставший с недавнего времени популярным в зарубежных исследованиях в таких областях, как медицина, социология, экономика и психология, все чаще встречается и в отечественных исследованиях [1], а также включается в обязательную систему знаний о методах психологии [2]. Это связано с тем, что, во-первых, наука переходит к проверке сложных и нетривиальных гипотез,

которые не могут быть верифицированы с помощью ставших классическими более простых статистических методов. Во-вторых, сам метод структурного моделирования обладает большим рядом преимуществ, среди которых: проверка сложных каузальных гипотез; выявление связей, которые могут отсутствовать в матрице интеркорреляций (поскольку оценка связей в структурном моделировании строится на основании матрицы резидуальных остатков, а не на корреляционной матрице). Наконец, одно из самых важных достоинств данного метода – представленность в модели звена латентных (ненаблюдаемых) переменных, представляющих из себя некоторые гипотетические конструкции, стоящие за изменениями наблюдаемых переменных, понимаемых как частный случай их – латентных переменных – манифестации. С их помощью можно оценивать взаимосвязи и взаимодействия между классами объектов или событий, а не делать утверждения относительно конкретных переменных [6].

В докладе будет показана эвристичность метода структурного моделирования на примере выявления неявных систем регуляции

личностного выбора при решении вербальных дилемм, включающих морально-этический аспект – готовность/неготовность манипулировать другими людьми ради достижения собственных целей – и готовность человека принимать и преодолевать ситуации неопределенности.

Мы основывались на том, что личностное свойство, фокусируемое латентной переменной Принятия неопределенности и риска [4], выступает медиатором, опосредующим влияние со стороны личностных ценностей в ситуации выбора. *Гипотеза* заключалась в том, что в различие предпочтений выбора будут вносить вклад переменные, манифестирующие не только достигнутые личностью стадии индивидуальной морали, но также толерантность/интолерантность к неопределенности – шкалы ТН и ИТН [3; 5].

В исследовании приняли участие 235 человек, студенты III курса факультета психологии МГУ им. М. В. Ломоносова. Применялась схема межгруппового квазиэкспериментального сравнения. Личностные свойства диагностировались с помощью опросников: *Справедливость-Забота* – в апробации С. Молчанова; *Новый*

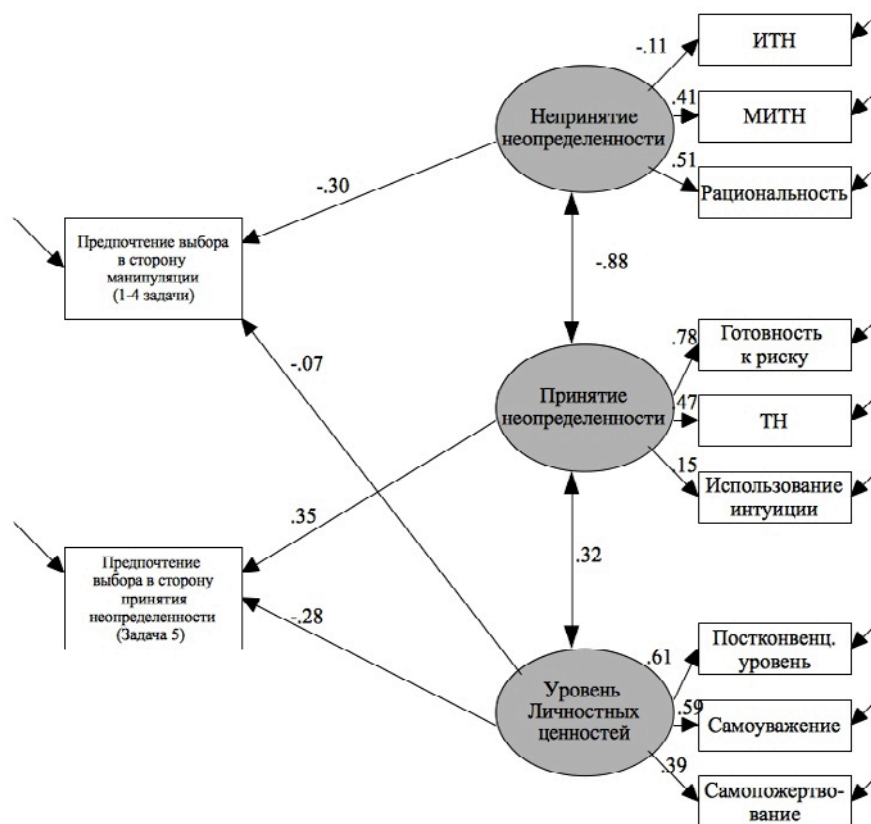


Рисунок 1. Структурная модель взаимосвязей переменных «Уровень личностных ценностей» и «Принятие-Непринятие неопределенности» как предикторов личностных выборов.

опросник толерантности к неопределенности (ИТН) Т. Корниловой; опросник ЛФР (Личностные факторы решений); шкалы доверия и использования интуиции С. Эпстайна.

Модель соответствует эмпирическим данным: $\chi^2(38) = 32,82$, $p = 0,67$; CFI = 1,00; RMSEA = 0,00 (90 % интервал от 0,00 до 0,044).

Как видно из модели, во-первых, на выборы в разных по содержанию задачах влияют разные латентные переменные. Во-вторых, модель подтверждает, что переменная Непринятие неопределенности должна пониматься как самостоятельный конструкт, а не противоположный полюс Принятия неопределенности. В-третьих, анализ индексов указывает на низкие связи Непринятия неопределенности с измеренной ИТН (при высокой связи с межличностной интолерантностью к неопределенности), что позволяет переформулировать эту латентную переменную как Рациональную интолерантность в межличностных отношениях.

В-четвертых, структурное моделирование позволяет установить систему взаимосвязей и влияний на тот или иной выбор латентных переменных, которую не смогли установить ни корреляционный, ни регрессионный анализ. И, в-пятых, структурное моделирование позволяет установить связь между латентной переменной

Уровень личностных ценностей и Принятие неопределенности, а также их реципрокное влияние на выбор в ситуации неопределенности. Оба факта вместе позволяют утверждать, что в тот момент, когда перед человеком встает задача на самоопределение, любой из психологических процессов, фокусируемых латентными переменными, может выйти на ведущий уровень.

Таким образом, этот метод может быть использован и в других науках, претендующих на изучение сложной и многомерной реальности.

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КРЕАТИВНОСТЬ, ЭМОЦИОНАЛЬНЫЙ ИНТЕЛЛЕКТ И ТОЛЕРАНТНОСТЬ К НЕОПРЕДЕЛЕННОСТИ КАК ПРЕДИКТОРЫ УСПЕШНОСТИ ОБУЧЕНИЯ

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Изучение предикторов успешности обучения сосредоточено вокруг влияния психометрического интеллекта на успеваемость. О роли эмоционального интеллекта (ЭИ) в академической успешности свидетельствуют авторы, занимающиеся разработкой этого конструкта [Гоулман, 2008]. Способность оперировать эмоциональной информацией о себе и других людях может проявляться в образовательном процессе, который именно в вузе характеризуется большим диапазоном неопределенности в организации собственной деятельности. Креативность также выступает предпосылкой продуктивной деятельности в высшей школе.

Как креативные процессы, так и работа с эмоциональной информацией подразумевают деятельность в ситуации неопределенности,

а также должны обеспечивать успешность человека в разных сферах, в частности, в образовании. Однако существуют только единичные работы на российских выборках, демонстрирующие роль креативности в высшей школе, а комплексных работ по изучению влияния ЭИ и креативности на успеваемость не проводилось.

В исследовании проверялась гипотеза о влиянии толерантности-интолерантности к неопределенности, эмоционального интеллекта и креативности на успешность обучения студентов (в рамках профессии «человек-человек»).

Процедура и методики

Испытуемые. В исследовании приняли участие 154 человека, все – студенты-третьекурсники факультета психологии Московского университета в возрасте от 18 до 24 лет ($M = 19,25$, $SD = 1,04$), 36 мужчин и 118 женщин.

Методики.

1. Для диагностики уровня креативности использовалась методика придумывания

		Нестандарт. коэффициенты		Стандарт. коэффициенты		Уровень значимости
Модель		B	Стандартная ошибка	Beta	t	
1	ТН	,040	,010	,646	4,090	,000
	ИТН	-,006	,011	-,083	-,530	,600
	МИТН	,054	,017	,429	3,127	,004
2	ТН	,036	,013	,579	2,737	,010
	ИТН	-,008	,012	-,110	-,668	,509
	МИТН	,052	,018	,414	2,907	,007
	МЭИ	,000	,024	,003	,014	,989
	ВЭИ	,010	,018	,106	,588	,561
3	ТН	,046	,012	,752	3,736	,001
	ИТН	,003	,011	,040	,251	,804
	МИТН	,054	,016	,428	3,319	,002
	МЭИ	-,028	,024	-,257	-1,156	,257
	ВЭИ	,007	,016	,077	,470	,642
	Креативность	,997	,360	,102	2,771	,010

Табл. 1. Коэффициенты регрессионного уравнения (зависимая переменная – успеваемость)

заголовков к комиксам [Sternebrg et al., 2006]. Получаемый креативный продукт оценивался фасеточным методом с частичным перекрытием четырьмя экспертами по шкалам «оригинальность», «сообразительность», «юмор» и «соответствие задаче». С.А. Корниловым в рамках IRT-подхода с использованием многоаспектной модели Раша был построен количественный показатель креативности – шкала логитов.

2. Для диагностики уровня *толерантности к неопределенности* использовался Новый опросник толерантности к неопределенности [Корнилова, 2010], который диагностирует три шкалы: толерантность к неопределенности (ТН), интолерантность к неопределенности (ИТН) и межличностная интолерантность (МИТН).

3. Уровень *эмоционального интеллекта* диагностировался с помощью опросника Д. Люсина [2004]; использовались две суммирующие шкалы внутриличностного (ВЭИ) и межличностного эмоционального интеллекта (МЭИ).

Также для всех испытуемых был посчитан средний показатель успеваемости.

Результаты

Предикторы устанавливались на основе линейной регрессии. Переменные добавлялись в регрессионное уравнение методом принудительного включения тремя блоками: шкалы опросника ТН, эмоционального интеллекта и креативность (методика Комиксы). Результаты представлены в табл. 1.

Предикторами успеваемости выступили ТН ($p=.001$), МИТН ($p=.002$) и креативность ($B=.997$, $p=.010$), уровень эмоционального

интеллекта в качестве такого предиктора не выступил. Таким образом, гипотеза отвергается для шкал ЭИ.

Обсуждение результатов

Определены предикторы успешности обучения студента в высшей школе. Такими предикторами выступили ТН, МИТН и креативность; при этом самый большой вклад обеспечивается креативностью. Это говорит о том, что те люди, которые способны принимать неопределенность и мыслить креативно, более успешны в учебной деятельности. При этом неожиданным оказался наш результат, что более успешными в образовании являются те студенты, которые менее гибки в межличностных отношениях (шкала МИТН). Тот факт, что ЭИ не является предпосылкой успешности студентов, соответствует результатам проведенного ранее корреляционного исследования (Корнилова и др., 2008). Нами показана критичная роль способность к творческому мышлению в условиях неопределенности (тест Комиксы), а также стремление к ясности в общении с другими людьми.

Выводы

Установлены предпосылки успешности обучения в высшей школе, которыми выступили способность действовать в ситуациях, характеризующихся неопределенностью, креативность и стремление к однозначности в общении с другими.

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КРИТЕРИИ ПРИНЯТИЯ РЕШЕНИЙ В ИГРЕ С НЕПРОТИВОПОЛОЖНЫМИ ИНТЕРЕСАМИ

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В данной работе понятие «игра», используемое в теории игр, аналогично понятию «ситуация взаимодействия», а «игра с непротивоположными интересами» – понятию «ситуация взаимодействия с неопределенностью». Дж. фон Нейман (1970) доказал для игры двух лиц с ненулевой суммой (с непротивоположными интересами) существование таких смешанных стратегий, которые максимизируют гарантированный выигрыш каждого из игроков.

Пусть для каждого из игроков, участвующих в игре, определена линейная комбинация выигрышей всех игроков с фиксированными коэффициентами. Критерий (цель, которой стремится достичь данный участник (игрок)) определяется как максимизация или минимизация заданной линейной комбинации выигрышей. Игра предполагается бескоалиционной, т.е. каждый игрок выбирает свою стратегию независимо.

Решением игры в данном случае будет множество смешанных стратегий всех игроков, которые соответствуют критериям, выбранным каждым из игроков. Естественно, что для заданной игры при некоторых выборах множества критериев игроками решение может существовать, а при других – нет.

Таким образом, определение решения игры, данное нами, является обобщением понятия решения игры, предложенного Дж. фон Нейманом.

Субъект в ситуации конфликта часто не ведет себя по правилам, предложенным нормативной моделью классической теории игр, а опирается на свои критерии. Ситуация будет приемлемой для обоих участников, если будет существовать решение игры в том смысле, как мы его ввели ранее, удовлетворяющее обоих участников.

Т.е. суть метода можно изложить следующим образом: в зависимости от индивидуальных особенностей и ситуации, у каждого участника формируется критерий его поведения в предложенной ситуации. Зная критерий и матрицы выигрышей, можно определить, можно ли при таких критериях найти решение из существующего набора, удовлетворяющее критериям обоих игроков и матрицам исходов. Если множества не имеют пересечений, то решение не существует.

Была предложена математическая модель (Савченко, 1987), которая позволяет спрогнозировать возможность существования решения игры при заданных критериях и стратегиях поведения участников, т.е. определить будет ли существовать удовлетворяющее обоих участников разрешение сложившейся ситуации.

Для проверки адекватности модели нами был разработан парный эксперимент. Написана программа для компьютерной коммуникации двух лиц на двух компьютерах. В процессе работы происходил обмен информацией между участниками посредством компьютеров, совершался выбор и получалась информация о своем выигрыше. Предлагалось два типа игр: с открытой информацией о выигрыше партнера и с закрытой (имелась информация только о своих выигрышах). Участники могли вести переговоры о выборе той или иной стратегии. Перед началом игры участникам предлагалось ознакомиться с легендами игр «семейный спор», «дилемма узника» и др. Перед испытуемым ставилась задача – набрать как можно больше баллов. Далее предлагалось определить, как будет совершаться действие: совместно с партнером или индивидуально. Кооперативная (совместная) стратегия принималась только в случае выбора ее обоими участниками. При кооперативной стратегии происходили переговоры участников по выбору действий и стратегий поведения. При совпадении предложений совершались ходы,

при несовпадении продолжался «торг». При этом фиксировались: протокол «торга», сами ходы, выигрыши за ход и суммарные выигрыши партнеров, время, затраченное на игру.

Формально критерии определяются по результатам торга, затем вычисляются частоты выбора стратегий участниками (реальные ходы). Выявление моментов смены стратегий проводилось по результатам торга, считалась частота предлагаемых игроками стратегий, из которых выбиралась наиболее часто предлагаемая пара. Нами проводился также контент-анализ торга, который позволил выявить причины выбора той или иной совместной или индивидуальной стратегии.

Данный эксперимент позволил подтвердить, что, действительно, испытуемые, ориентирующиеся на какие либо критерии выходили на решение, спрогнозированное моделью, либо не находили решение и меняли стратегию или останавливали игру.

Разработанный эксперимент был опробован на двух группах испытуемых: неформально знакомой и неизвестных друг другу респондентах (Савченко, 2002).

Эксперимент во второй группе является более чистым с точки зрения проверки предложенной модели, т.к. наличие дополнительных целей усложняет задачу и делает ее не формализуемой с точки зрения теории игр. Однако анализ результатов экспериментов, проведенных с первой группой, дает возможность

оценить влияние дополнительных целей на ход переговоров.

Сравнивая результаты контент-анализа торга двух групп игроков между собой, можно заметить, что у знакомой неформально группы игры проходили более насыщенно, т.е. появлялись дополнительные цели, разнообразящие игры. Во второй группе с увеличением количества сыгранных игр проявлялась тенденция к некоторому нивелированию личностных характеристик, т.е. большинство участников выходили на кооперативные стратегии, которые давали максимально гарантированный выигрыш.

Проведенное экспериментальное исследование позволило верифицировать предложенную теоретико-игровую модель принятия решений в диадном взаимодействии, выделить реально используемые стратегии поведения и соотнести их с оптимальными, а также сформулировать ряд рекомендаций по построению систем, обучающих ведению переговоров (Savchenko T. N., Golovina G. M., 2010).

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ИССЛЕДОВАНИЕ УВЕРЕННОСТИ В РЕШЕНИИ КОГНИТИВНЫХ ЗАДАЧ С НЕОПРЕДЕЛЕННОСТЬЮ (ПОРОГОВОЕ РАЗЛИЧЕНИЕ)

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Пороговые задачи, как и другие сенсорные, относятся к базовому уровню когнитивной сферы. В них высока субъективная неопределенность, вызванная дефицитом входной информации. Поэтому для наблюдателя типичны субъективные переживания сомнений в принимаемых решениях, что характерно также для большинства других когнитивных задач с неопределенностью. Исследования механизмов принятия решения и уверенности в нем бурно развиваются в зарубежной науке, начиная с середины XX в. Изучаются два основных аспекта уверенности (*Ув*). а) *Ув* в себе как личностная

характеристика – принятие себя, своих действий, решений, навыков как уместных, правильных: исследуется на материале личностных опросников. б) *Ув* в правильности своих суждений (ситуативная уверенность): исследуется на материале опросников на общую осведомленность (на когнитивном уровне знаний) и задач по сенсорному различению (на сенсорном уровне). Доминирующая за рубежом парадигма (развиваемая сейчас и в России) – исследования реализма *Ув*: степени соответствия между *Ув* человека в правильности своих суждений и их объективной правильностью. Личностная *Ув* понимается как производная от ситуативной, обобщенная на всем опыте субъекта.

Теоретический анализ проблемы (Скотникова, 2008) позволил предположить, что *Ув* в

суждениях – системное психическое образование, выполняющее и когнитивную функцию (вероятностный прогноз правильности решений), и метакогнитивную (рефлексия своих знаний), и регулятивную (переживание и состояние, связанные с этими процессами и влияющие на латентность и результат решения: на принятие той или иной гипотезы в зависимости от прогноза их правильности), и когнитивно-регулятивную (оценка правильности решения). В силу всех этих функций *Ув* является существенной детерминантой как приема и переработки информации, так и принятия решения и его самоконтроля (Скотникова, 2008).

На материале зрительных временных интервалов изучались соотношения между тремя основными характеристиками решения в наиболее распространенной в практике, но наименее изученной в психофизике задаче различения «одинаковые-разные»: правильности ответов, их скорости и *Ув* (Скотникова, 2005). Наблюдатели для каждой пары стимулов давали 2 ответа: а) «одинаковы» или «различны» длительности стимулов; б) уверены они или сомневаются в правильности своего 1-го ответа.

Результаты. 1) Ошибочные ответы медленнее верных. Это верифицирует применительно к пороговому различению «правило Свенсона» для трудного опознания и инструкции на точность ответов. (В отличие от этого, для легкого опознания и инструкции на скорость ответов, ошибки быстрее верных ответов).

2) Ошибочные ответы чаще неуверенные, чем верные, в обеих типичных задачах различения: «одинаковые-разные» («=, ≠») и «больше-меньше» («>, <»). Неуверенность ответов может служить внешним индикатором неотчетливости сенсорных впечатлений, замедляющей принятие решения. В целом, чем больше время ответов, тем меньше их *Ув*. Эти данные проясняют психологическую природу ошибок человека в задачах порогового типа.

3) В зарубежной литературе ведется острая дискуссия между приверженцами классического феномена «недостаточной *Ув*» в сенсорном различении, в сравнении с его правильностью, и парадоксального эффекта «трудности – легкости» (недостаточной *Ув* в легком различении, и сверхуверенности – в трудном. Нами в трудной пороговой задаче «=, ≠»-различения обнаружена сверхуверенность, что согласуется со второй точкой зрения. Думается, что человек склонен недооценивать сложность трудных задач и потому переоценивать свою *Ув* в их решении, и наоборот – переоценивать сложность легких задач и оттого недооценивать свою *Ув*.

4) Установленная в задаче «=, ≠» сверхуверенность явилась следствием в шесть раз более узкой зоны сомнений и специфичности структуры этой зоны, в сравнении с задачей «>, <». По целому ряду показателей *Ув* хуже оценивалась человеком в задаче «=, ≠». По-видимому, низкий реализм *Ув* в сторону высокой сверхуверенности связан с грубым, приблизительным характером «=, ≠»-различения, дающим более высокие пороги, в сравнении с более тонким и точным характером «>, <»-различения, дающим на порядок меньшие пороги, что генерализуется и на более точные оценки *Ув*.

5) Зарубежные исследования реализма *Ув* выходят на проблему межкультурных различий. Шведские авторы описывают недостаточную *Ув* как типичную для сенсорно-перцептивных суждений, в отличие от когнитивных суждений высших уровней (об общей осведомленности), для которых типичен эффект трудности-легкости. Вместе с тем канадские, американские и австралийские исследователи обнаружили этот эффект в сенсорном различении. На основании этих данных канадские специалисты предположили межкультурные различия в сенсорной *Ув* аналогично ряду данных для вероятностных прогнозов. Эта гипотеза подтвердилась в сравнительном исследовании, проведенном автором на российской и немецкой выборках для порогового различения временных интервалов (Skotnikova et al., 2001). Обнаружена сверхуверенность в немецкой выборке, в среднем вдвое меньшая, чем в российской, но на порядок большая, чем известная для канадской выборки, в отличие от недостаточной *Ув*, характерной для шведских испытуемых. Продолжение этого исследования Е.В. Головиной выявило большую сверхуверенность в общей осведомленности в российской выборке, в сравнении с немецкой, тогда как в сенсорном различении – примерно одинаковый уровень сверхуверенности. Это расхождение с данными автора, видимо, вызвано различием профессионального состава выборок.

6) *Ув* оказалась выше у импульсивных лиц, в сравнении с рефлексивными, что может объяснить большую поспешность и ошибочность импульсивных: принятие решения, доверяясь себе, без тщательного анализа информации. Этот результат также был подтвержден Головиной.

Ув выступает как психологический механизм саморегуляции процесса решения и внутренней обратной связи, позволяющей корректировать решения.

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ЛОКАЛИЗАЦИЯ ОППОНЕНТНЫХ МЕХАНИЗМОВ ПРИНЯТИЯ РЕШЕНИЙ ВО ФРОНТАЛЬНОЙ КОРЕ

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Развитие методов цифрового синтеза и обработки изображений позволило методами иконики целенаправленно создавать тестовые изображения, с помощью которых можно избирательно активировать различные структуры зрительной системы. Это важно, так как методы картирования откликов мозга, или методы нейроиконки (neuroimaging), адекватно работают при оптимальном цифровом синтезе тестовых изображений. Подобное сочетание методов синтеза тестов и цифровой обработки реакций мозга позволяют выделять структуры головного мозга, активированные в результате этого избирательного воздействия. Цель исследования – локализация областей мозга, участвующих в принятии решения о форме объекта, о текстурах, о значении объекта, о пространственных отношениях между объектами.

Так, при различении стимулов нейтральных и имеющих значение для наблюдателя, мы получили различную локализацию центров во фронтальной коре. Эта «находка» позволила предположить существование нескольких центров принятия решений во фронтальной области. Между этими областями имеются оппонентные внутрикорковые связи. Оппонентная конструкция ранее была открыта для «сенсорного мозга». Мы показали, что оппонентность присуща и структурам, принимающим решение и осуществляющим команду для организации движений. Оппонентная конструкция нейронных сетей фронтальной области обеспечивает адекватное поведение в повседневных и в экстремальных ситуациях. Именно оппонентная конструкция механизмов принятия решений определяет характер непрерывной деятельности человека и ее пароксизмы.

В психофизических, электрофизиологических и фМРТ исследованиях временного и пространственного картирования мозговой активности мы получили результаты, свидетельствующие о том, какие фронтальные зоны коры мозга человека вовлечены в область принятия решений. Становится понятной сложная мозаика фронтальной коры, представленная системой отдельных зон, осуществляющих решения различного рода. Временные характеристики этой финальной стадии обработки зрительной информации таковы, что процессы принятия решений в этом контексте происходят после стимуляции в интервале 200–500 мс, а двигательный ответ – в интервале 520–630 мс. Помимо процессов, которые развиваются до моторной реакции, имеются устойчивые реакции мозга, мы их называем «волны уверенности», после принятия решений и после моторной реакции. Их время развития – 400–1100 мс. Их развитие происходит при соблюдении условий принятия решений и сохранении на экране (в поле зрения наблюдателя) изображения, о котором принято некое суждение.

С помощью метода диффузной тензорной трактографии и последующей математической обработки данных мы реконструировали пути из затылочной части к тем же центрам принятия решений во фронтальной области, которые были локализованы с помощью фМРТ (Шелепин и др. 2011). Мы обнаружили, что области принятия решений имеют связи с различными областями зрительной коры. Важно, что происходит прямая и обратная взаимосвязь затылочных и лобных областей, включены в процесс и области теменной и нижневисочной коры. Эти данные хорошо согласуются с общей моделью обработки информации зрительной системой, которая учитывает прямые восходящие и нисходящие связи и оппонентные взаимодействия. Особый интерес представляет пространственно-частотное описание взаимодействия фронтальных и затылочных областей коры. В лобных областях идет обработка преимущественно низкочастотного описания наблюдаемых изображений, полученного из затылочно-теменной коры. На

основании этого описания происходит принятие решения – отбор объекта в лобной коре. Однако неполная низкочастотная информация может быть подвергнута перепроверке. Из «сцены внешнего мира», представленной как в низко-, так и в высокочастотном пространственном спектре в затылочной коре, объект может быть

выделен и запрошен лобной корой уже с другим разрешением.

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МЕХАНИЗМ ПРИНЯТИЯ РЕШЕНИЯ И КОНТРОЛЯ ЕГО ПРАВИЛЬНОСТИ, ОСНОВАННЫЙ НА СВИДЕТЕЛЬСТВАХ

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Известны математические модели принятия решения и оценки уверенности в сенсорном различении: основанные на теории обнаружения сигнала (ТОС), на последовательных выборках, аккумуляторные, модель шкалирования сомнений (см. Baranski, Petrusic, 1998). Эти модели предлагают продуктивные подходы для описания уверенности, но не содержат теоретических формул для выражения уверенности наблюдателя в виде регистрируемых оценок вероятности правильности или ожидаемой полезности решения. Однако опытный наблюдатель легко выражает свою уверенность в субъективных оценках вероятности. В нашей работе предложен психологический механизм принятия решения, основанный на ТОС: выделены математические переменные, имеющие смысл свидетельств в пользу альтернативных решений, с помощью которых можно как измерить величину уверенности наблюдателя в выборе решения, так и выразить ее через вероятность правильности или ожидаемой полезности выбранной сенсорной гипотезы.

1. Принятие решения и оценка уверенности в нем в задаче выбора наиболее вероятных гипотез. Апостериорные вероятности присутствия сигнала и шума в предъявленном стимуле задаются формулами $P(\mathbf{sn}|x) = [\psi_0 l(x)] / [1 + \psi_0 l(x)]$, $P(\mathbf{n}|x) = 1 - P(\mathbf{sn}|x) = 1 / [1 + \psi_0 l(x)]$, где: \mathbf{sn} – предъявление сигнала, \mathbf{n} – предъявление шума, x – значение сенсорного впечатления от стимула, $\psi_0 = P(\mathbf{sn}) / P(\mathbf{n})$ – отношение априорных вероятностей предъявления сигнала и шума, $l(x) = f(x|\mathbf{sn}) / f(x|\mathbf{n})$ – отношение правдоподобия. Отношение полученных апостериорных вероятностей при этом равно $\psi(x) = P(\mathbf{sn}|x) / P(\mathbf{n}|x) = \psi_0 l(x)$. После введения новых переменных $\Psi_0 = \ln(\psi_0)$, $L(x) = \ln[l(x)]$, $\Psi(x) = \ln[\psi(x)] = \Psi_0 + L(x)$ были получены более наглядные выражения

для апостериорных вероятностей $P(\mathbf{sn}|\Psi(x)) = 0.5 + 0.5th[\Psi(x)/2]$, $P(\mathbf{n}|\Psi(x)) = 0.5 - 0.5th[\Psi(x)/2]$ (Шендяпин и др., 2010). Из них следует, что с ростом переменной $\Psi(x)$ вероятность правильности гипотезы H_s («предъявлен сигнал») монотонно увеличивается от 0 до 1, а вероятность правильности гипотезы H_n («предъявлен шум») монотонно уменьшается от 1 до 0. Это дает основания считать $\Psi(x)$ свидетельством в пользу H_s . Далее аргумент x переменной $\Psi(x)$ будет опущен.

Правило принятия решений в задаче выбора наиболее вероятной гипотезы: если $\Psi > 0$, то следует выбрать H_s , т.к. вероятность правильности ответа \mathbf{Y} («да, предъявлен сигнал») $P(\mathbf{sn}, \mathbf{Y}|\Psi) = 0.5 + 0.5th[\Psi/2] > 0.5$; если же $\Psi < 0$, то следует выбрать H_n , т.к. вероятность правильности ответа \mathbf{N} («нет, предъявлен шум») $P(\mathbf{n}, \mathbf{N}|\Psi) = 0.5 - 0.5th[\Psi/2] > 0.5$. Критерий принятия решений в данной задаче расположен в точке $\Psi_{cr} = 0$.

Свидетельство Ψ является суммой Ψ_0 и $L(x)$. Переменную $\Psi_0 = \ln[P(\mathbf{sn}) / P(\mathbf{n})]$ можно считать *несенсорным частотным свидетельством*: её положительное значение свидетельствует в пользу H_s , а её отрицательное значение – в пользу H_n . Переменная $L(x) = \ln[f(x|\mathbf{sn}) / f(x|\mathbf{n})]$ является *сенсорным свидетельством*: её положительное значение свидетельствует в пользу H_s , а её отрицательное значение – в пользу правильности H_n . Введенная нами *сумма свидетельств* Ψ позволяет не только выбирать ответ, имеющий наибольшую вероятность правильности, но и дает математическое представление уверенности в ответе. Уверенность в правильности ответа \mathbf{Y} можно определить как расстояние от полученного в данном наблюдении Ψ до критерия $C_{Ycor} = \Psi > 0$, а уверенность в правильности ответа \mathbf{N} – формулой $C_{Ncor} = -\Psi > 0$.

2. Принятие решения и оценка уверенности в нем в задаче выбора наиболее полезных ответов. Предложенная модель позволяет описать уверенность для случая, когда каждый

ответ наблюдателя вызывает появление определенного значения осознаваемого результата V . Соответствующие дискретные значения V зависят от правильности/ошибочности выбранного ответа. Правильность ответа осознается через положительные (полезные) значения v_{snY} , v_{nn} результата V , тогда как ошибочные ответы – через отрицательные (неполезные) значения результата v_{snN} , v_{nY} . В каждом наблюдении субъект должен выбрать ответ, дающий ему наибольший результат.

Показано, что полезность ответа Y (определяемую как среднее значение результата V) можно представить как $E[V(Y|\Psi)] = 0.5(v_{snY} + v_{nY}) + 0.5(v_{snY} - v_{nY}) \text{th}(\Psi/2)$, а полезность ответа N как $E[V(N|\Psi)] = 0.5(v_{snN} + v_{nN}) + 0.5(v_{snN} - v_{nN}) \text{th}(\Psi/2)$ (Шендяпин и др., 2010). Полезность ответа Y с ростом свидетельства Ψ монотонно растет от отрицательного значения результата v_{snN} до положительного v_{snY} , тогда как полезность ответа N при этом монотонно падает от положительного значения v_{nn} до отрицательного v_{snN} . Кривые полезностей этих ответов пересекаются в точке $\Psi_{cr} = -L_v$, где $L_v = \ln[(v_{snY} - v_{snN}) / (v_{nn} - v_{nY})]$ зависит от дискретных значений результата V . Эта точка (в которой полезность ответов достигает своего минимума $E(V)_{min}$) служит критерием принятия решений в данной задаче.

Правило принятия решения в этой задаче: если полученное сенсорное впечатление x приводит к неравенству $\Psi > -L_v$, то следует выбрать ответ Y , т.к. его полезность $E[V(Y|\Psi)]$ больше полезности $E[V(N|\Psi)]$ ответа N ; если же $\Psi < -L_v$ – то следует выбрать ответ N , т.к. его полезность $E[V(N|\Psi)]$ больше полезности $E[V(Y|\Psi)]$.

Из неравенства $\Psi > -L_v$ следует неравенство $\Psi + L_v > 0$, где $\Psi = \Psi_0 + L(x)$. Поэтому правило принятия решения при выборе наиболее полезного ответа можно переформулировать: положительное значение суммы $\Psi_v = \Psi_0 + L(x) + L_v$ можно рассматривать как *свидетельство* в пользу выбора ответа Y , а отрицательное – как

свидетельство в пользу ответа N . Третье слагаемое L_v можно назвать *мотивационным свидетельством*. Это особый вид априорного несенсорного свидетельства. Его величина влияет на выбор наиболее полезного ответа, т.к. определяет критерий выбора ответа $\Psi_{cr} = -L_v$, но при этом не влияет на вероятность правильности ответа. В этом смысле оно является «мнимым» свидетельством, возникающим только благодаря появлению в задаче *осознаваемых* результатов ответов.

Уверенность в наибольшей полезности выбранного Y -ответа можно определить как расстояние от полученного в данном наблюдении Ψ до критерия $C_{util} = \Psi - \Psi_{cr} = \Psi_0 + L(x) + L_v$. Таким образом, эта уверенность равна сумме частотного, сенсорного и мотивационного свидетельств, которая в данном случае положительна, т.к. был выбран Y -ответ. C_{Nutil} – уверенность в наибольшей полезности выбранного N -ответа определяется как разность $\Psi_{cr} - \Psi$. Таким образом, $C_{Nutil} = -[\Psi_0 + L(x) + L_v] > 0$ потому, что сумма свидетельств $\Psi_0 + L(x) + L_v$ является отрицательной при выборе N -ответа.

Полученная модель предсказывает большую правильность уверенных ответов по сравнению со всеми (уверенными и неуверенными) ответами. Это подтверждено в обоих основных видах задач сенсорного различения: «больше – меньше» и «одинаковые – разные» для зрительных стимулов: пространственных (диаметры кругов) и временных (длительности), предъявлявшихся соответственно одновременно и последовательно. Таким образом, этот факт является достаточно общим.

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ПРИНЯТИЕ РЕШЕНИЙ О РАЗМЕРЕ В НОРМЕ И ПРИ ПСИХОПАТОЛОГИИ

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В основе нейрофизиологического процесса принятия решения лежат сложные взаимодействия первичных проекционных зон анализаторов, затылочных, височных, теменных и лобных долей мозга. Основными каналами, обеспечивающими первичную фильтрацию зрительной информации, являются крупноклеточные магноцеллюлярные и мелкоклеточные парвоцеллюлярные каналы, берущие начало в сетчатке, с проекциями через латеральное коллатеральное тело таламуса к различным слоям зрительной коры. Далее эту информацию разным способом используют нейроны дорзального либо вентрального пути. Взаимодействие этих каналов на лобном уровне коры обеспечивает опознание объектов и принятие решения. Дисбаланс в работе магно- и парвоцеллюлярных систем приводит к нарушению непрерывности процесса сознательного восприятия и активного выбора.

Настоящее исследование посвящено изучению механизмов принятия решения у больных шизофренией. Непосредственно, исследованию функционального состояния магноцеллюлярной и парвоцеллюлярной систем у больных шизофренией. С этой целью использовали стимулы, отвечающие одному из основных свойств названных каналов – чувствительности к различным пространственным частотам. Известно, что парвоцеллюлярные каналы более чувствительны к высоким пространственным частотам, тогда как нейроны магноцеллюлярной системы – к низким пространственным частотам.

Наши измерения способности больных наблюдателей к оценке относительных размеров изображений парных фигур Мюллера-Лайера, подвергнутых вейвлетной фильтрации, содержащих узкий спектр либо высоких, либо низких пространственных частот, свидетельствуют, что на начальной стадии клинических проявлений шизофрении имеет место нарушение работы механизмов, связанных с парвоцеллюлярными зрительными каналами, с сохранением функций магноцеллюлярных каналов. Тогда как у

пациентов с хронической стадией шизофрении имеет место нарушение работы высших зрительных механизмов, связанных как с парвоцеллюлярными, так и магноцеллюлярными первичными зрительными каналами (Shoshina et al., 2011).

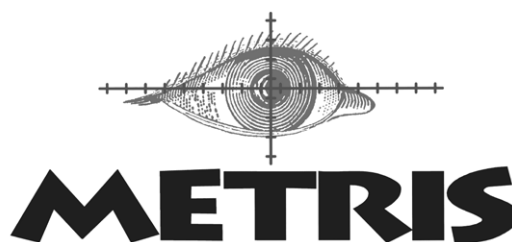
С целью получить дополнительные данные о функциональном состоянии первичных магно- и парвоцеллюлярных зрительных каналов у больных шизофренией использовали метод визоконтрастометрии (Шелепин и др., 1985), позволяющий измерять методом «лестницы» (Бардин, 1976) пороги контрастной чувствительности при различной пространственной частоте тестовых изображений. В исследовании участвовали 20 психически здоровых наблюдателей и 38 больных шизофренией с диагнозом F20.0 по классификации МКБ–10. Среди больных: 20 пациентов с начальной стадией клинических проявлений и 18 человек с хронической стадией шизофрении. На экране монитора 17» на расстоянии 4 м до испытуемого предъявляли элементы Габора с пространственной частотой 0,45; 3,6 и 17,9 цикл/градус. Испытуемому сообщали, что на экране будут появляться решетки разной частоты. Задача – нажать на кнопку мыши, когда решетка появится, и держать до тех пор, пока она не исчезнет, затем отпустить кнопку и дождаться, когда решетка вновь появится. Установлено, что у больных шизофренией с начальной стадией клинических проявлений снижена контрастная чувствительность в области высоких пространственных частот, тогда как у хронически больных – в области и высоких, и низких частот. Таким образом, в ходе двух исследований получены свидетельства нарушения у больных шизофренией работы ретино-стриарных парво- и магноцеллюлярных механизмов и, соответственно, вентральных и дорзальных путей высших отделов, то есть свидетельства рассогласования в работе этих систем, характер которого зависит от длительности заболевания.

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Metris is a leading manufacturer of advanced systems for animal behavior analysis
 (in-vivo experiments) that are sold globally.

Main products are: LABORAS and SONOTRACK.

LABORAS is an advanced system that automates behavior recognizing, registration, tracking and analysis of small laboratory animals. The system identifies more than 18 validated stereotypical and normal behaviors in mice and rats, and simultaneously tracks positions. LABORAS does not use video or infrared beams! There are over 100 publications about the use of LABORAS by several leading researchers, pharmaceutical companies, CRO's and leading universities from around the world.

SONOTRACK is an advanced system to record, analyze and playback ultrasound vocalizations. The system is highly valued for research in Anxiety, Stress, Memory, Learning, Pain, Sexual related, Safety Pharmacology, Developmental (Neuro) Toxicity and Social Interaction tests. SONOTRACK is the best ultrasound vocalization system on the market today because of its full spectrum USV recording (15 kHz to 125 kHz) characteristics, extremely low noise, long duration recording capability and reliable detection of rodent calls fully automatically!!

In the CIS countries Metris sells modular vivariums and laboratory cabins and several other vivarium and laboratory equipment, including cages, Individual Ventilated Cages (IVC racks), workstations, washing machines, wireless equipment for animal identification and temperature registration, systems for wireless measurement of physiology parameters and sleep analysis software. In addition several other systems for molecular and cellular analysis are being offered.

Metris is exclusive distributor for DataSciences International, LabProducts, Bio Medical Data systems (BMDS) and Kissei Comtec.

Метрис является ведущим производителем передовых систем для анализа поведения животных
 (в in- vivo экспериментах), которые продаются по всему миру.

Основная продукция: LABORAS и SONOTRACK.

LABORAS - система для полного автоматического распознавания, регистрации и анализа поведения маленьких лабораторных грызунов (крыс, мышей), основанная на анализе вибрации и энергии. Система отслеживает положение и определяет более 18 стереотипных и нормальных типов поведения у мышей и крыс. LABORAS не использует видео и инфракрасных лучей! Издано более ста публикаций об использовании LABORAS несколькими ведущими исследователями, фармацевтическими компаниями, CRO и ведущими университетами по всему миру.

SONOTRACK - система для записи, воспроизведения, анализа и визуализации ультразвуковых вокализаций лабораторных животных. Система используется для исследования беспокойства, стресса, обучения /памяти, боли, сексуальных связей, фармакологии безопасности, развития (нейро) токсичности и социального благосостояния. SONOTRACK – самая лучшая ультразвуковая система для вокализации, имеющаяся на рынке, благодаря полной записи спектра USV (15 кГц до 125 кГц), чрезвычайно низкому уровню шума, возможности длительной продолжительности записи и полностью автоматического обнаружения ультразвуков у грызунов!

В странах СНГ Метрис продает модульные виварии, лабораторные кабины и ряд другого оборудования для вивариев и лабораторий, в том числе клетки, индивидуальные вентилируемые клетки и "IVC" стеллажи, рабочие станции, стиральные машины, беспроводное оборудование для идентификации животных, системы беспроводного измерения параметров физиологии и программное обеспечение для анализа сна. Кроме того, предлагается ряд других систем для молекулярного и клеточного анализа.

Metris имеет эксклюзивное право от DataSciences International, LabProducts, Bio Medical Data systems (BMDS) и Kissei Comtec.