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 **FEATURES OF THE SPEECH UTTERANCE KEY ELEMENTS PERCEPTION PROCESS**

**Annotation.** A review of modern psychophysiological studies of the speech perception process was conducted, as well as a new empirical study, which revealed the connection of psychophysiological correlates of keywords in the poetic speech utterance perception with the level of human intelligence. Using psychological and psychophysiological techniques, as well as software and statistical data processing, it was revealed that the process of keywords perception in a speech message depends on the level of human intelligence. This dependence is mediated by individual characteristics of the mirror system reactivity. The most distinguished reactions to keywords are inherent in the subjects with the highest reactivity of the mirror neuron system.

**Keywords:** speech, mirror neuron system, electroencephalogram, intelligence level, wavelet transform.

**ОСОБЕННОСТИ ПРОЦЕСCА ВОСПРИЯТИЯ КЛЮЧЕВЫХ ЭЛЕМЕНТОВ РЕЧЕВОГО ВЫСКАЗЫВАНИЯ**

**Аннотация.**

Был проведён обзор современных психофизиологических исследований процесса восприятия речи, а также было проведено новое эмпирическое исследование, которое позволило выявить связь психофизиологических коррелят восприятия ключевых слов в речевом высказывании поэтической формы с уровнем интеллекта человека. С помощью психологических и психофизиологических методик, а также программной и статистической обработки данных было выявлено, что процесс восприятия ключевых слов в речевом сообщении зависит от уровня интеллекта человека, причем эта зависимость опосредована индивидуальными особенностями реактивности зеркальной системы мозга. Наиболее выраженные реакции на ключевые слова присущи испытуемым с наибольшей активностью зеркальной системы мозга.

**Ключевые слова:** речь, зеркальная система мозга, электроэнцефалограмма, уровень интеллекта, вейвлет-преобразование.

The relevance of the psychophysiological mechanisms study underlying the process of speech perception is due to insufficient knowledge of this issue [2]. The emergence of new information about the connection of the speech perception process with the mirror neuron system [4,5].

As part of the current research, a review of modern psychophysiological studies of the speech perception process was conducted, as well as a new empirical study, which revealed the connection of psychophysiological correlates of keywords in a poetic speech utterance perception with the level of human intelligence. The results of psychophysiological studies of speech perception in recent years [9, 10] indicate that the process of human speech utterances comprehension requires special attention and represents a promising field for research. It is known from the works of Russian authors [1, 3] that such mental processes as speech and thinking are closely interrelated. In this connection, it is of particular interest to identify the psychophysiological correlates of the keywords perception in a speech message and their interrelations with the level of human intelligence development.

In the empirical part of the work, the dependence of the speech perception process on the level of human intelligence and its mediation by individual characteristics of the mirror neuron system reactivity were investigated. With the help of psychological and psychophysiological techniques, as well as software and statistical data processing, the hypothesis presented below was confirmed.

**Research hypothesis**: the keywords perception process in a speech message depends on the level of human intelligence, and this dependence is mediated by individual characteristics of the mirror neuron system reactivity. The most pronounced reactions to keywords are inherent in the subjects with the highest reactivity of the mirror neuron system.

The empirical base of the research is the Department of General Psychology and Psychophysiology of the Institute "Taurida Academy" of the V.I. Vernadsky CFU.

As part of the study, the intellectual development level of the V.I. Vernadsky CFU students was assessed: 39.5% had a high level of intellectual development, 34.9% had a good norm, 25.6% had an average. Reduced norm, borderline level and mental defect were not detected. The sample consisted of 43 students aged 18-33 years.

The methodological basis of the work were the concept of the speech perception process by the Dutch psychophysiologist M. Bastiansen [8] and the mirror neuron system concept by J. Rizzolatti [9] and M. Jacoboni [10].

The following methods were used in the study: the Wexler test modified by Y. Filimonenko (diagnosis of the of intelligence development level, adult version), the author's questionnaire for assessing the peculiarities of speech utterances perception and the method of recording electroencephalogram signals in situations of speech perception, as well as hand movements observation when writing syllables and words.

The electroencephalogram was registered using the equipment "Mizar-EEG-10/70-201" (LLC "Mizar", St. Petersburg). Data analysis was carried out using standard statistical methods (parametric and nonparametric) and time-frequency analysis (wavelet transform) tools in the programs EEGLAB 2019, MATLABR2019b, "STATISTICA 12".

The use of psychological and psychophysiological tools, software, as well as methods of statistical data processing allowed us to draw the main conclusions presented below:

1. People with a high level of intellectual development perceive the meaning of speech utterances much faster. Even before the end of pronouncing phrases, there is a pronounced activation of the mirror neuron system, reflecting the prediction of spoken actions and their awareness.

2. The higher the person verbal intelligence is, the more the mirror neuron system is activated at the moment of perception of expressions containing verbs that are suitable in meaning. And the more severe suppression occurs at the moment of unsuitable for the context of the poem phrases perception.

The theoretical significance of the work lies in the possibility of using empirically confirmed conclusions for the development of the mirror neuron system theory.

The practical significance of the study lies in the possibility of using the research results to modernize the methods of detecting violations in children and adults speech perception. The proven technique of recording and processing electroencephalogram signals in the speech perception process formed the basis of the project "Development of the software package for early diagnosis of autism spectrum disorders by analyzing the features of an electroencephalogram in the speech perception process", implemented within the framework of the "UMNIK" program in 2021-2022 with grant support from the Innovation Assistance Fund.

**References**

1. Vygotsky L.S. Thinking and speech: psychological research / L.S. Vygotsky; [preface by L.F. Obukhova]. - M.: National Education. - 2019. - 368 p.

2. Karlov V.A. The development of ideas about the organization of the speech system / V.A. Karlov, V.M. Shklovsky, V.S. Zolovkina // Journal of Neurology and Psychiatry named after S.S. Korsakov. - 2017. - No. 5. - pp. 4-8.

3. Luria A. R. Lectures on general psychology / A. R. Luria. - St. Petersburg: Peter, 2006. - 320 p.: ill.

4. Ramachandran V.S. Riddles of our consciousness/ V.S. Ramachandran. - Moscow: Olymp-Business. - 2006– - 224 p.

5. Ramachandran V.S. The brain tells: what makes us human / V.S. Ramachandran. - Moscow: Career Press. - 2015. - 498 p.

6. Rizzolatti J., Corrado S. Mirrors in the brain: On the mechanisms of joint action and empathy / J. Rizzolatti, S. Corrado// Translated from English by O. A. Kurakova, M. V. Falikman. - M.: Languages of Slavic cultures. - 2012– - 208 p.

7. Iacoboni M. Reflecting in people: why we understand each other/ M. Iacoboni. - M.: United Press LLC. - 2011. - 366 p.

8. Bastiaansen M. Vibrational dynamics of neurons during language comprehension / M. Bastiaansen, P. Hagurt// Progress in brain research. - 2006. - Vol. 159. - 179-196.

9. Kul P. Brain mechanisms in early language acquisition/ P.Kul// Neuron. - 2010. - Vol.5. - No. 67. - pp.713-727.

10. Schneider J. Differences in the development of neural oscillations underlying the processing of auditory sentences in children and adults /

J. Schneider, A. Abel, D. Ogila, K. McCord, M. Maguire// Brain and language. - 2018. - No. 186. - pp.17-25.