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The activity of the parietal cortex in the reaction of choice after a traumatic brain injury compared with the anterior cingulate cortex activity in the control group

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It is now generally accepted that the decision-making process and executive control imply involving the prefrontal cortex, which provides the selection of actions based on perceptual cues and reward values. The goal of the present study is to examine the effect of traumatic brain injury on contribution of the prefrontal cortex to the neural basis of decision making process. Integration of information processing is the fundamental principle of brain activity. We propose the method of wavelet transformation of EEG based on image recognition ideas using Krawtchouk functions as mother-wavelet. The method makes it possible to determine the temporal location of the maximum peaks of the EEG wavelet - spectrum. Thus, we search out the synchronization of brain activity in different derivations and different frequency ranges. In the group of soldiers who had traumatic brain injury (TBI) on the fighting in the East of Ukraine, during the choice reaction time task the interhemispheric synchronization was detected in the somatosensory cortex as well as in the occipital-parietal lobe. In this case, using the EEG source localization by LORETA (Low Resolution Brain Electromagnetic Tomography), the maximum activity in the subgenual gyrus was identified. While in the control group interhemispheric synchronization was detected in the prefrontal and frontal areas and occipital - frontal dynamics of signal processing were determined. Herewith the maximum activity was hold in the anterior cingulate cortex. Compared to the control group in the group of soldiers with TBI, the choice reaction was mainly based on the activity of inferior parietal lobule.

Recent Publications

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2. A. Knyr, N. Filimonova, M. Makarchuk, A. Cheburkova, I. Zyma, V. Kalnysh, Features of interhemispheric functional connectivity in the brain of military man with traumatic brain injury during the realization of a simple sensorimotor reaction // Bulletin of the Kyiv University. Series: Biology. - 2018.- V.1(75).- P. 50 – 54. (in Ukrainian)
3. Filimonova N. Distant synchronization of human brain activity based on wavelet analysis using Krawtchouk functions // VII International Congress of Ukrainian Society for Neuroscience June 7-11, 2017. – Kyiv. – P.44.
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Biography

Natalia Filimonova is a Senior Scientist, ESC "Institute of biology and medicine", National Taras Shevchenko University of Kyiv, Grant of the Ministry of Education and Science "Development of methods of neurophysiologic diagnostics and correction of the consequences of traumatic brain injury, concussion and post-traumatic stress disorder in ATO participants" since 2018. During 2011-2017, she worked as a Senior Scientist in the Department "Physiology of the Brain and Psychophysiology" of the Peter Bogach Scientific Research Institute of Physiology, ESC "Institute of biology", National Taras Shevchenko University of Kyiv. She also worked as Senior Scientist in Research Laboratory of Physiological Cybernetics and Psychophysiology, Biology Faculty in National Taras Shevchenko University of Kyiv, Senior Engineer of Kiev Research Oncology Institute of the Ministry of Health, USSR, Kyiv, Scientist at Institute of Cybernetics of the National Academy of Sciences of Ukraine, Kyiv.

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