

# Mild Traumatic Brain Injury and Post-traumatic Stress Disorder: Difference in Brain connectivity in sensorimotor reactions tests as a differential diagnostic criterion

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## Abstract

We investigate the characteristics of the Choice Reaction Time (CRT) and Simple Reaction Time (SRT) and brain networks in testing of Reaction of Choice (RC) and of Simple Reaction (SR) in the combat-injured Ukrainian Armed Forces service members with mild Traumatic Brain Injury (mTBI) and posttraumatic stress disorders (PTSD) who took part in combat in East Ukraine. Compared with the control group, patients with PTSD and mTBI had significantly longer SRT, but only patients with TBI had significantly longer CRT and CRT - SRT. In SR test in the PTSD group we found a shift in brain activity to the zones in the occipital area that are responsible for the primary and secondary visual information processing and a decrease in the number of interregional brain connections in the low-frequency bands that indicate more local information processing. In the mTBI group we found decreased activity in the frontal cortex and increased activity in the parietal zone, especially in the left hemisphere and only local neural networks in the high-frequency range in the fronto-parietal areas were formed. In the control group in the test of RC revealed a complete neural network of transformation of the visual stimulus in the motor response. Two interconnected frontal-parietal-occipital and temporo-parietal-occipital neural networks were identified that provide effective recognition of visual stimulus and formation of adequate, effective sensory-motor integration due to global and coordinated local processes of strategic decision-making. In the PTSD group, the CR is performed with reduced activity in the frontal area and increased activity of the ventral network and Insula of the right hemisphere, which may indicate an emotional component in the decision-making system even with respect to emotionally neutral stimuli (square and triangle). mTBI revealed dysfunction of the dorsal pathway, decreased connectivity between all brain structures and the interhemispherical interaction.

## 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.

## Publications

1. Neurophysiological features of the brain functioning of veterans of the armed forces of Ukraine with traumatic brain injuries and post-traumatic stress disorders during testing of simple sensorimotor reaction
2. Corvutin modulates the content of lipids in rat liver bile
3. LORETA mapping and coherence analysis reveal brain functional connectivity features during choice reaction task in military service members with mild traumatic brain injury and posttraumatic stress disorder
4. Ocular Influence of Nano-Modified Fullerene Light, 2: Time Correlation of the Choice and Simple Sensorimotor Reactions That Determine Blinding Compensation of the Driver
5. Features of interregional interaction in the brain of military men with traumatic brain injuries during testing visual working memory on complex stimuli

[3<sup>rd</sup> International Conference on Central Nervous System & Therapeutics](#) | July 17-18, 2020

**Citation:** Natalia Filimonova, Mild Traumatic Brain Injury and Post-traumatic Stress Disorder: Difference in Brain connectivity in sensorimotor reactions tests as a differential diagnostic criterion, CNS 2020, 3rd International Conference on Central Nervous System & Therapeutics, Amsterdam, Netherlands, July 17-18, 2020, 10