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Stimulation therapy with complex-structured stimuli in the neurorehabilitation after TBI

The recent achievements in the studies of neuroplasticity led an enhanced attention to internal restorative strategies. Neurorehabilitation, based on the principles of neuroplasticity, is considered to be the promising way to mitigate the adverse consequences of traumatic brain injury (TBI) to cognitive functions. The ability of the brain to restore and to create the neural connections makes it essential to search for methods that could stimulate the restoration of disturbed networks and also can help building the new ways to compensate the deficit of the cognitive functions. Technologies of cognitive rehabilitation relying on the structural and functional plasticity of the brain include programs of mental and physical training and various techniques of stimulation therapy, including transcranial magnetic and electrical stimulation, and noninvasive sensory stimulation exploiting the BWE phenomenon. Currently, the stimulation therapy applies a periodic rhythm of audio, visual and other signals which can provide the local improvement of the cortical activity in the particular range of oscillations. But it is unable to restore the complex dynamics of the activity of the brain characteristic of a healthy person and therefore, cognitive performance of the person. We suppose that in patients after brain injuries, the fractal flicker stimulation, and the stimulation by complex-structured sound tones and signals of other modalities will promote activating the structural-functional plasticity and improving the memory and other cognitive functions. Changes in the cortical activity evoked by fractal stimuli can mediate the impact of stimulation on cognitive performance. The use of new approaches to neurorehabilitation aimed to increase the potential of neuroplasticity can also improve the therapeutic effects of other known methods of the training the brain. That is, the period of enhanced plasticity can present some therapeutic temporal window, during which an increase in the efficiency of different others neurorehabilitation measures should be expected.

Speaker Biography

Marina Zueva is a professor of Pathophysiology and graduated from the Lomonosov Moscow State University (Physiology of Higher Nervous Activity), received her Ph.D. and Biol. Sci. D. from Moscow Helmholtz Research Institute of Eye Diseases. Currently, she is the Head of the Division of Clinical Physiology of Vision at the Moscow Helmholtz Research Institute of Eye Diseases. She has published over fifteen peer-reviewed full-length papers in English (over 100 in Russian) and presented near 70 topics at international conferences.

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