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The role of technologies of nonlinear stimulation in the treatment of brain diseases and potential of their applications in healthy individuals

Marina V Zueva
Moscow Helmholtz Research Institute of Eye Diseases, Russia

In 2015, the theory was proposed that links the development and maintenance of the typical in norm complex structure of neural networks and the activity of the brain with the complexity of visual and other sensory environmental signals that affect the person during the life. The theory of 'Fractality of sensations' implies that the simplification of the temporal structure of environment cues is associated with abnormal development and aging of the central nervous system. As well, the use of fractal photic stimulation and nonlinear stimuli of other modalities may enhance the effectiveness of strategies for a recovery in the structure and function of the retina and brain, including neurodegenerative pathology, by reactivation of neuroplasticity. Application of nonlinear brain stimulation technology is promising in the treatment of neurological disorders and injuries to increase the effectiveness of restoration of the anatomic and functional structure of the brain, cognitive functions and behavior. In the spectrum of nonlinear stimulating therapy techniques different variants of mono- and multimodal fractal stimulation should be used, as well as its combinations with white noise, music therapy, cognitive, and physical training. We substantiate the potential use of non-linear stimulation technologies in a healthy person in a variety of situations that can lead to a simplification of the neural circuits and pattern of brain activity. Application of physiologically adequate nonlinear stimuli is promising to slow and prevent age-related cognitive impairment in the elderly, in rehabilitation and recovery programs for healthy individuals of certain professions associated with severe physical or psychological stress, and athletes. One can expect that the use of nonlinear techniques to restore physical and mental performance after heavy load and effects of stress factors will help to restore the complex nonlinear dynamics of functional activity, maintaining a high level of criticality and improving the adaptive brain reserve.

Biography

Marina V Zueva has graduated from the Lomonosov Moscow State University (physiology of higher nervous activity), received her PhD and doctor of science 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 is a member of International Society of Clinical Electrophysiology of Vision (ISCEV), European Association on Vision and Eye Research (EVER) and European Society of Retina Specialists (EURETINA). She has published over ten peer-reviewed papers in English (over 86 in Russian) and has presented over 65 topics at international conferences.

visionlab@yandex.ru

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