Dr. Herbert and Nicole Wertheim Leadership in Healthcare and Medicine Lectureship

Non-invasive brain stimulation: research and potential therapeutic application

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Biography

Milos R. Ljubisavljevic is a Professor of Physiology at the College of Medicine and Health Sciences, United Arab Emirates University, UAE. Prof. Ljubisavljevic graduated and received his MS and PhD from the Faculty of Medicine, University of Belgrade, Serbia. He teaches neuroscience and medical physiology and pathophysiology. He served as a Deputy Director of the Institute for Medical Research, University of Belgrade, Serbia until 2000. Among his positions, Prof. Ljubisavljevic was the Chair of Laboratory for Experimental Clinical Neurophysiology at the Institute for Medical Research, University of Belgrade, Serbia. He also served as the Chair of Laboratory for Neurophysiology at the Center for Musculoskeletal Diseases, University of Umea and University of Gevle. His research involves physiologic and pathophysiologic mechanisms of cortical plasticity and motor control with special interests in movement disorders. His broader interests include normal and abnormal pain mechanisms. He is a member of the editorial board of the Journal of Functional Morphology and Kinesiology. He also serves on various national and international grant review committees and as an ad-hoc reviewer for several international journals.

Abstract

Plasticity is an intrinsic property of the human brain. It is the mechanism for development and learning, as much as a cause of pathology. Modulating brain plasticity provide important means to manipulate and guide behavior potentially achieving the best functional outcomes for a given subject. Non-invasive brain stimulation (NIBS) has shown its potential to modulate brain plasticity in humans. The rationale for use of NIBS is that if abnormalities in brain activity and physiology believed to cause clinical deficits in neurological diseases are reversed, normal functioning could be restored. This can be achieved either by enhancing adaptive processes and/or preventing or suppressing maladaptive ones. Some of the applicable NIBS techniques include repetitive transcranial magnetic stimulation (rTMS), and transcranial direct-current stimulation (tDCS).

This lecture will outline the contemporary framework of NIBS therapeutic application, including the rational, principles and mechanisms of action in treatment of selected examples of common neurological diseases. For example, NIBS in stroke was shown to facilitate functional recovery of both sensorimotor and higher cognitive impairment, such as aphasia and neglect. In Parkinson's disease, NIBS was shown to improve both motor and non-motor symptoms. In dystonia, NIBS was successfully used to augment the loss of inhibition, which is one of the most important hallmarks in the pathophysiology of dystonia. Finally, in chronic tinnitus NIBS was shown to induce relief, including strong reductions in tinnitus loudness. At the end I will briefly discuss some of the open controversies and future directions of the field.

Co-sponsor information.

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