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Nivethida Thirugnanasambandam

Assistant Professor
Department of Biosciences and
Bioengineering
IIT Bombay, India



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Role of Neural Oscillations in Motor Control – Anecdotal or Causal?

Abstract: Neural oscillations arise from rhythmic fluctuations of electrical activity generated in the central nervous system either spontaneously or in response to a certain stimulus. There is sufficient evidence to believe that oscillations enable precise coordination of neural processes underlying cognition, memory, perception, and behavior via spectrotemporal synchronization of neural activity within and across brain regions. Motor behavior, like other sensory and cognitive processes, also seems to be associated with specific oscillatory patterns. However, whether such an association is causal or just an epiphenomenon still remains a point of discussion. In this talk, I will introduce neural oscillations and their functional significance in motor control, and discuss how noninvasive brain stimulation studies have added evidence to establish a causal relationship with motor behavior. Further, I will also touch upon the role of ‘pathological’ oscillations in movement disorders with Parkinson’s disease as an example and will finally conclude with proposing noninvasive neuromodulation methods as a potential add-on tool for the treatment of neuropsychiatric disorders.

Brief Bio: Dr. Nivethida Thirugnanasambandam has a medical degree from JIPMER Pondicherry followed by a Masters in Biomedical Engineering from IIT Bombay. She then did her PhD in Neuroscience with Prof Michael Nitsche at the University of Goettingen, Germany and a 5-year postdoc with Dr. Mark Hallett at the National Institute of Neurological Disorders and Stroke, NIH, Bethesda, USA. She is currently Assistant Professor at the Department of Biosciences and Bioengineering at IIT Bombay where she Leads the Human Motor Neurophysiology and Neuromodulation Lab. Her research focuses on understanding the role of neural oscillations in human motor control and in the pathophysiology of movement disorders, and further employing noninvasive brain stimulation to perturb abnormal behavior.