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A novel neurocomputational model of the effect of dopamine medication and deep brain stimulation o gait dysfunction in Parkinson's disease

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Parkinson's Disease (PD) is a motor disorder associated with reduced levels of dopamine in the basal ganglia and prefrontal cortex that simulate the effect of Sub-Thalamic Deep Brain Stimulation (STN DBS) as well as dopaminergic medications on gait dysfunction. The model incorporates interactions among the cortex, basal ganglia and cerebellum. Results show that the model captures empirical findings related to tremor and gait dysfunction in PD patients. Additional simulation studies show that while dopaminergic medications can ameliorate tremor in a subset of PD patients (but not gait), STN DBS can effectively manage both tremor and gait dysfunction.

Biography

Ahmed Moustafa is trained in Computer Science, Psychology, Neuroscience and Cognitive Science. His early training took place at Cairo University in Mathematics and Computer Science. Before joining Western Sydney University as a Lab Director, he spent 11 years in America studying psychology and neuroscience. He conducts research on computational and neuropsychological studies of addiction, schizophrenia, Parkinson's disease, PTSD and depression. He has published over 130 papers in high-ranking journals including Science, PNAS, Journal of Neuroscience, Brain, Neuroscience and Biobehavioral Reviews, Nature (Parkinson's disease), Neuron, among others. He has recently published two books: Computational Models of Brain and Behavior, which provides a comprehensive overview of recent advances in the field of computational neuroscience, and Computational Neuroscience Models of the Basal Ganglia, which provides several models of the basal ganglia.

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