

Basal ganglia oscillations as biomarkers for targeting circuit dysfunction in Parkinson's disease

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Abstract

Oscillations are a naturally occurring phenomenon in highly interconnected dynamical systems. However, it is thought that excessive synchronized oscillations in brain circuits can be detrimental for many brain functions by disrupting neuronal information processing. Because synchronized basal ganglia oscillations are a hallmark of Parkinson's disease (PD), it has been suggested that aberrant rhythmic activity associated with symptoms of the disease could be used as a physiological biomarker to guide pharmacological and electrical neuromodulatory interventions. We here briefly review the various manifestations of basal ganglia oscillations observed in human subjects and in animal models of PD. In this context, we also review the evidence supporting a pathophysiological role of different oscillations for the suppression of voluntary movements as well as for the induction of excessive motor activity. In light of these findings, it is discussed how oscillations could be used to guide a more precise targeting of dysfunctional circuits to obtain improved symptomatic treatment of PD.

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