



## Effect of pallidotomy on sensorimotor synchronization in Parkinson's disease

**Ilona Laskowska<sup>(1)</sup>, Simone Dalla Bella<sup>(2)</sup>,  
Paulina Rolinska<sup>(2)</sup>, Aleksander Litwinowicz<sup>(3)</sup>,  
Edward Jacek Gorzelańczyk<sup>(1)</sup>, & Marek Harat<sup>(3)</sup>**

- (1) Institute of Psychology, Kazimierz Wielki University, Bydgoszcz, Poland
- (2) Department of Cognitive Psychology, University of Finance and Management in Warsaw, Poland
- (3) Department of Neurosurgery, Military Hospital n. 10, Bydgoszcz, Poland

When we listen to rhythmic auditory stimuli (e.g. music) we often spontaneously or deliberately move in sync with their beat (e.g. by foot tapping). Sensorimotor synchronization (SMS) has been linked to the activity of the basal ganglia and of the cerebellum. To clarify the contribution of the basal ganglia to SMS, we examined SMS in 10 nondemented patients suffering from intractable Parkinson's disease (Experimental group) 2 days before, 3 months, and 6 months after pallidotomy (i.e. surgical treatment consisting in the ablation of the postero-ventral portion of the Gpi). The Experimental group was compared to 2 matched control groups: 10 nondemented medicated Parkinson's disease patients and 10 healthy participants. Patients and controls were asked to tap their finger/hand along with 1) a sequence of nonmusical stimuli (i.e. a metronome), 2) familiar music, and 3) amplitude-modulated noise. Moreover, perceptual tests (i.e. detection of anisochrony) were performed. The patients in the Experimental group exhibited impaired SMS before surgery as compared to controls. Only very few patients in the Experimental group showed improved synchronization (i.e. a larger number of synchronized taps and smaller variability) 3 and 6 months after the surgery. Most patients either maintained the initial performance or exhibited worse synchronization accuracy. In contrast, pallidotomy had a positive effect on time perception: in several cases the performance in the anisochrony detection tests improved 3 and 6 months after the surgery. These findings suggest that SMS and the detection of anisochrony may be supported by partly independent neuronal substrates.

