

## The effect of subthalamic nucleus deep brain stimulation on executive and memory functions in Parkinson's disease

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### Abstract

#### *Introduction:*

Although the improvement of motor symptoms in Parkinson's disease after deep brain stimulation (DBS) of the subthalamic nucleus (STN) is well documented, there are open questions regarding its impact on cognitive functions (Fasano et al., 2012). The aim of the present study was to assess the effect of bilateral DBS of the STN on executive and memory functions in PD patients using an unstimulated PD control group matched on age, education, disease duration, motor symptoms, medication and DBS indication.

#### *Method:*

Thirteen PD patients with DBS implantation (DBS group) and 15 PD wait-listed patients (control group) participated in the study. A neuropsychological battery was used to assess cognitive functions, including general mental ability (Mini Mental State Examination), verbal (digit span) and spatial short-term memory (Corsi block-tapping task), working memory (n-back task), executive functions (phonemic and semantic verbal fluency, Stroop task, Trail Making B task), and event-based prospective memory (see Burgess et al., 2001). Each task was administered twice: before and after surgery in the DBS group with the stimulators on and with a similar time interval between the two task-administration points in the control group.

#### *Results:*

A series of mixed design ANOVAs was used with group (DBS vs. control group) as a between-subjects factor and assessment points (1<sup>st</sup> vs. 2<sup>nd</sup>) as a within-subjects factor. There was no significant difference between the DBS and the control groups' performance in tasks measuring short-term verbal, spatial and working memory and executive functions assessed by the Trail Making B and the Stroop Tasks. The DBS group showed a significant decline on the semantic verbal fluency task after surgery compared to its own baseline level ( $p < .05$ ). Additionally, the DBS group showed a decreased execution cost score at the second assessment point of the prospective memory task, compared to the control group ( $p < .05$ ).

#### *Conclusion/Discussion:*

Our results provide support for the cognitive safety of the STN DBS using a wait-listed PD control group. The DBS group showed impaired performance after the surgery only on the

semantic verbal fluency task which is in line with findings of previous studies. Furthermore, to the best of our knowledge, this is the first study to show that DBS of the STN boosts prospective memory, in particular intention execution functions. The findings will be discussed considering different possible effects of the STN DBS on frontostriatal networks.

*References:*

Burgess PW et al. *Neuropsychologia*. (2001) 39:545-555.

Fasano A et al. *Lancet Neurol*. (2012) 11:429-42.