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OBJECTIVE

To compare performance on intra- and extra-dimensional alternating fluency tasks for bilateral subthalamic nucleus deep brain stimulation (STN-DBS), medically managed Parkinson's disease (PD), and matched healthy control (HC) participants.

BACKGROUND

Following STN-DBS, studies have reported cognitive changes in verbal fluency and new learning, which are believed to be dependent upon intact functioning of the frontostriatal neural system.

However, the specific cognitive processes subserved by this circuitry potentially affected by the surgery, including intra- versus extra-dimensional set shifting and internal and external monitoring, have not been well studied.

PARTICIPANTS

24 STN-DBS, 18 PD, and 16 HC individuals received a comprehensive neuropsychological assessment at baseline and 6 months.

Table 1 - Demographics

	HC	PD	DBS	p value
Age	62.9 (13.0)	66.1 (8.6)	59.9 (11.8)	0.07
Education	16.1 (1.5)	16.5 (1.1)	14.3 (2.5)	0.002
Sex (% Male)	37.5	83.3	58.3	0.02
Duration Illness		6.4 (3.9)	9.1 (6.0)	0.10
H & Y		2.25	2.50	0.78

The STN-DBS and PD patients were comparable for stage and duration of illness. All groups were comparable for age.

A significant difference between the groups was found for gender and education (Table 1); variables were used as covariates when appropriate.

TESTS ADMINISTERED

Alternating verbal fluency tasks were used to investigate semantic versus phonemic processing, cued versus uncued responding, and intra- versus extra-dimensional set shifting.

Participants were asked to generate as many words as possible within 1-minute, while alternating between two letters, two categories, or a letter and a category (e.g., "D", "S"; Girl's Names, Furniture; and Food).

Internal versus external monitoring was evaluated using uncued versus cued measures.

RESULTS

STN-DBS patients demonstrated a decline in the number of words generated on the cued phonemic/phonemic alternating fluency 6-months post surgery (**p=0.008**; Figure 1a).

The groups did not differ on the uncued phonemic/phonemic alternating fluency task (p=0.17; Figure 1b).

Figure 1a

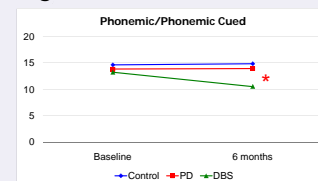
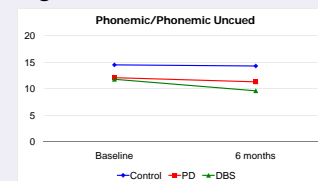


Figure 1b



The groups did not differ significantly on the cued or uncued semantic/semantic alternating fluency tasks (p=0.06; p=0.83, respectively; Figures 2a and 2b).

Figure 2a

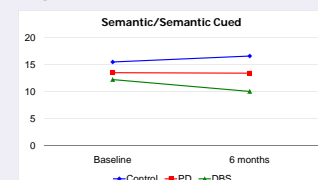
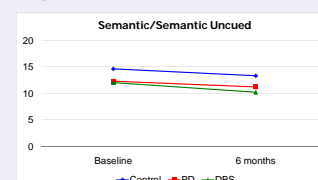


Figure 2b



RESULTS CONT'D.

STN-DBS patients showed a larger decline in the number of words generated on uncued phonemic/semantic alternating fluency 6-months post-surgery in comparison to the PD patients (**p=0.03**; Figure 3b).

The groups did not differ on the cued phonemic/semantic alternating fluency task 6-months post surgery (p = 0.20; Figure 3a).

Figure 3a

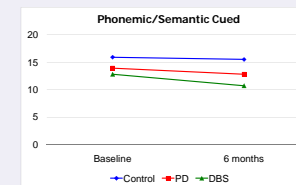
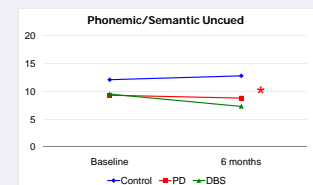


Figure 3b



SUMMARY & CONCLUSIONS

STN-DBS patients demonstrated declines in frontostriatal functioning on measures of alternating fluency 6 months following surgery.

Specifically, external monitoring intradimensional shifting and internal monitoring extradimensional shifting were affected by the surgery.

These changes in frontostriatal functioning are not due to disease progression alone.

Further research regarding the effects of STN-DBS on verbal fluency is warranted.

STN-DBS candidates should be counseled about the potential frontostriatal cognitive declines following STN-DBS surgery.

ACKNOWLEDGMENT: This research was supported by NIH/NINDS K23 (MKY) and the Veterans Affairs, Office of Research and Development.