

DBS of the STN in Parkinson's Modulates the Value of Sensory Evidence

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Introduction

While DBS of the STN effectively treats many of the motor symptoms associated with Parkinson’s disease, it has also has been found to increase impulsive behavior. Several recent studies have suggested that patients use less evidence to make decisions. In this study, we tested this hypothesis using a task specifically designed to determine the decision bound, the maximum amount of evidence collected before making a decision. Subjects responded at will on some trials but were interrupted on other trials, presumably before they had hit the bound.

Methods

Patients with bilateral STN DBS completed multiple 30-minute sessions of an auditory task, in which they listened to two simultaneous Poisson-generated click trains presented from different headphones. They were instructed to respond with the side of the most clicks. The subjects responded prior to termination of the click trains, or the click trains stopped prior to their response. Half of each session was completed with DBS off.

A 9-parameter drift diffusion model was fit to each subject’s decision-making. Each trial type was fit separately. This was complemented

Results

7 patients have been enrolled in the study and have completed 13 sessions. Enough data has been obtained from 3 patients to permit modeling, and data collection is ongoing. DBS does not have a clear effect on the number of clicks after which a decision is made (increased in 1/7, decreased in 1/7, (p<0.01) no change in 5/7). Instead, DBS increased parameters describing the value of sensory evidence. In each of the 3 patients, DBS increased either the variance in the value of each click or the value of clicks that were temporally close to previous clicks (p<0.05).

Conclusions

STN DBS appears to modulate the value of evidence instead of modulating the decision threshold.

Learning Objectives

By the conclusion of this session participants should be able to describe different models for how DBS affects decision-making.

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