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Differential effects of deep brain stimulation (DBS) on speech and limb movements in Parkinson's Disease (PD): Clues to basic mechanisms.

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Source

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Abstract

A puzzling finding has been that STN DBS improves limb motor function, while at the same time providing little benefit to or even markedly worsening speech. In collaboration with Peter Fox's Research Imaging Institute in San Antonio, we combined objective measures of speech with PET imaging and TMS in a PD patient with speech deficits due to STN DBS. Stimulating the left STN produced deteriorated speech together with hyperactivation of left dorsal premotor cortex (PMd), an area known to project to the left STN. TMS to left PMd with DBS off, produced similar speech impairments as DBS stimulation. These findings are consistent with STN DBS antidromically disrupting left PMd activity, thereby causing speech deterioration. In contrast, STN DBS is known to improve limb motor control. We have been examining the effects of STN DBS on reaching to and grasping objects, on reaching to kinesthetically defined 3-D targets, and on inhibiting a pre-programmed action. We have found that bilateral STN DBS improves all of these behaviors, although to varying degrees. Moreover, EEG recordings during response inhibition suggested that the physiological mechanism for the improved behavioral control involves normalization of brain rhythms that may be involved in transferring information within cortico-basal ganglia circuits. [Work supported in part by NIH grant #2 R01 NS036449 and ONR MURI Award No.: N00014-10-1-0072].

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