How is it that deep brain stimulation (DBS) to one and the same, merely centimeter-long subcortical brain structure—the subthalamic nucleus (STN)—can be effective in treating cardinal dysfunctions in disorders as heterogeneous as dystonia (DYT), Parkinson’s disease (PD), Tourette’s syndrome (TS), and obsessive-compulsive disorder (OCD)?

**METHODS & COHORTS**

- **AIM:** To investigate the topographical organization of fronto-cortical & subcortical dysfunction mappings

**RESULTS (DISCOVERY COHORTS)**

- At the cortical level, network organization of dysfunction was reflected in form of a caudo-rostro anatomical topography that spanned the frontal lobe from sensorimotor (DYT), followed by pre-motor (TS & PD) toward prefrontal-most regions (OCD). A comparable but miniaturized caudo-rostro organizational pattern of selective stimulation effects onto cortical dysfunctions was mirrored locally, within the STN.

**MODEL VALIDATION RESULTS**

- The same order of dysfunction mappings (motor disorders in sensorimotor and premotor cortices toward associative/limbic OCD connections) emerged for clinically beneficial sets of streamlines filtered from the Massachusetts General Hospital Single Subject 760-µm Connectome (a) [8], the Human Connectome Project 985 Connectome (b) [5,6], the Basal Ganglia Pathway Atlas (c) [7], the DBS Tractography Atlas v.2 (d) [8], as well as an OCD (e) and a PD-matched connectivity (f) [8].

**CONCLUSIONS**

The miniaturized anatomical representation of dysfunction within the subcortex may explain why DBS to the STN can be used as an effective treatment for a variety of brain disorders of heterogeneous phenomenology.

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- > "What is the impact of deep brain stimulation (DBS) to the subthalamic nucleus (STN) on the functional connectivity of the human brain?"

> "The miniaturized anatomical representation of dysfunction within the subcortex may explain why DBS to the STN can be used as an effective treatment for a variety of brain disorders of heterogeneous phenomenology."