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DBS OPENS A WINDOW INTO THE ORGANIZATIONAL GRADIENT OF FRONTAL NETWORK (DYS)FUNCTION.

SEGREGATING THE PREFRONTAL CORTEX BY MEANS OF DBS

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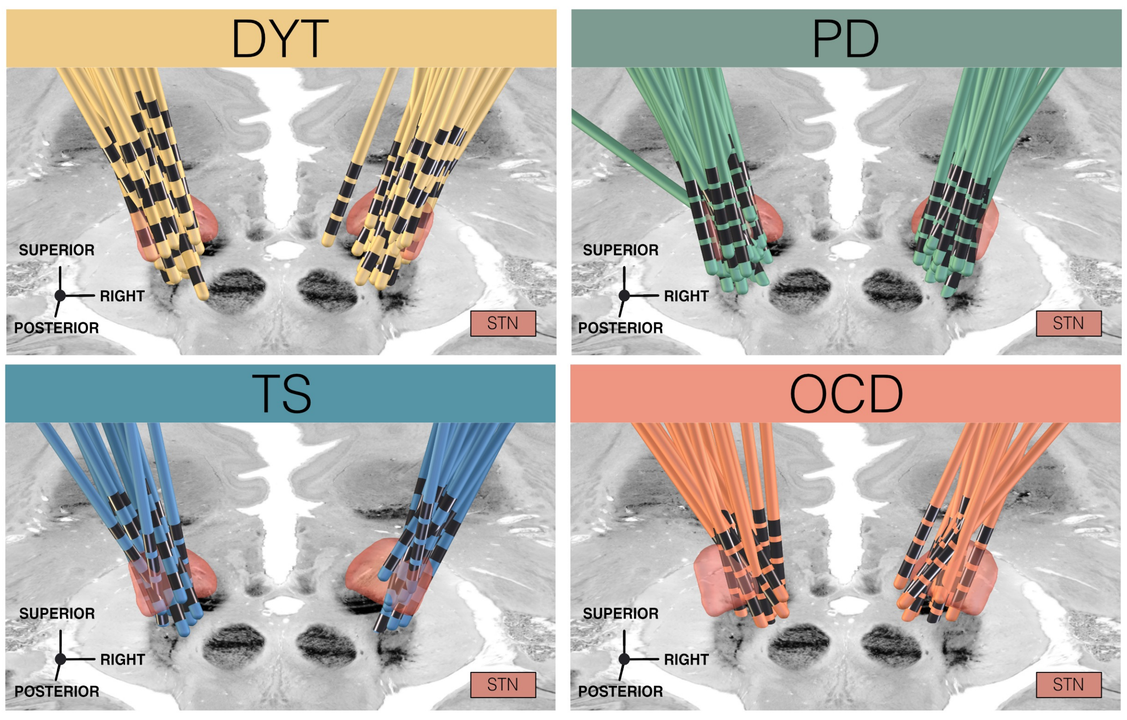
INTRODUCTION

- Fronto-subcortical neurocircuits are involved in the **motor, cognitive, and affective dysfunctions** of multiple brain disorders which can be treated by DBS

AIM

- To investigate the **functional segregation of the prefrontal cortex** via optimal connectivity profiles from DBS electrodes to the **subthalamic nucleus** (STN) treating 4 different disorders

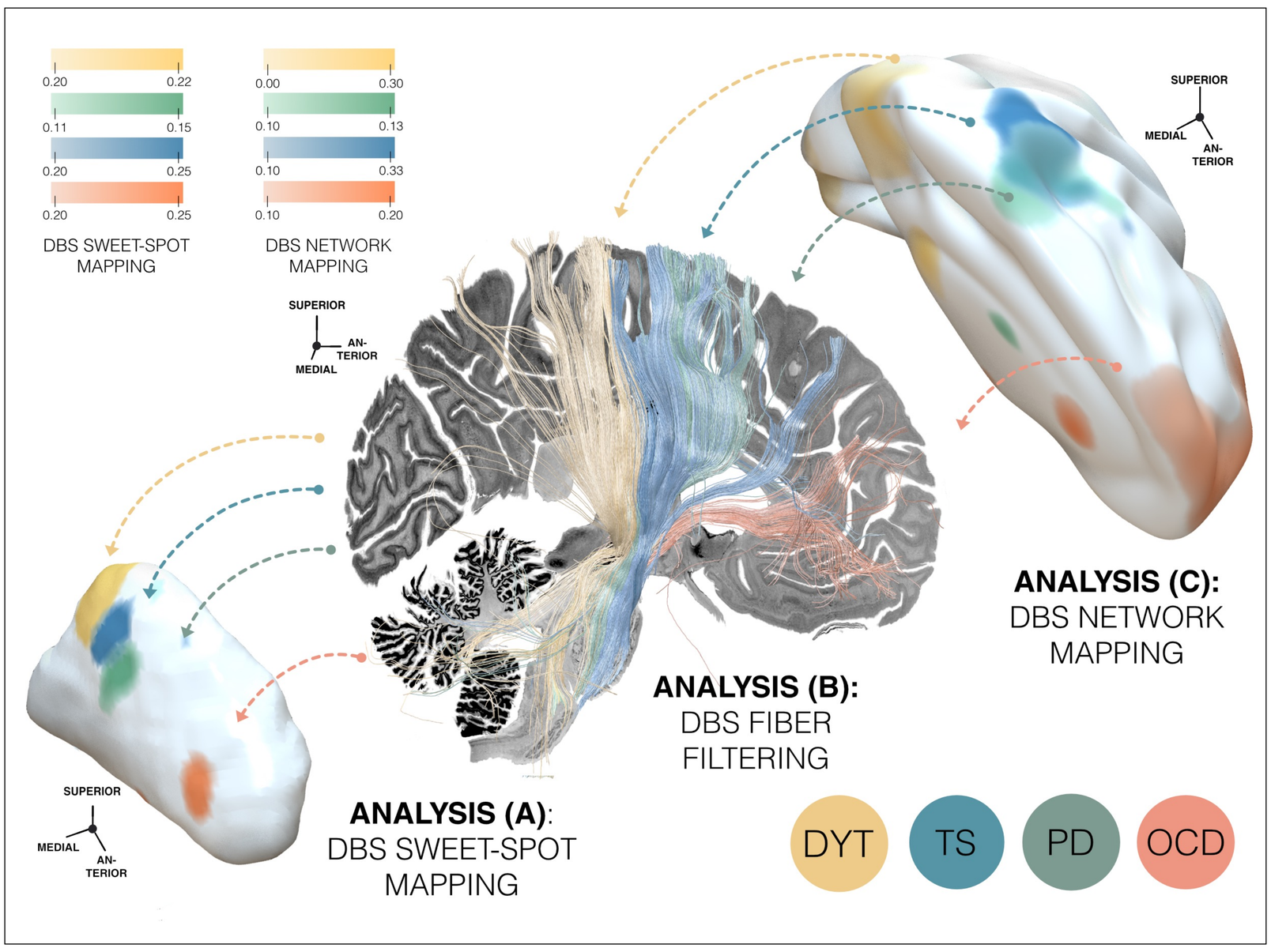


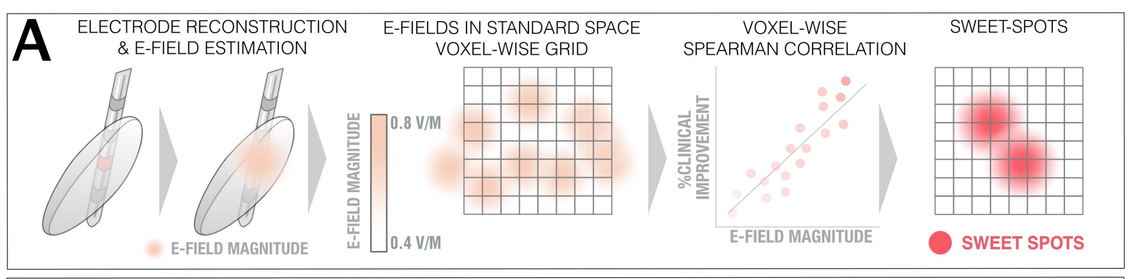
METHODS

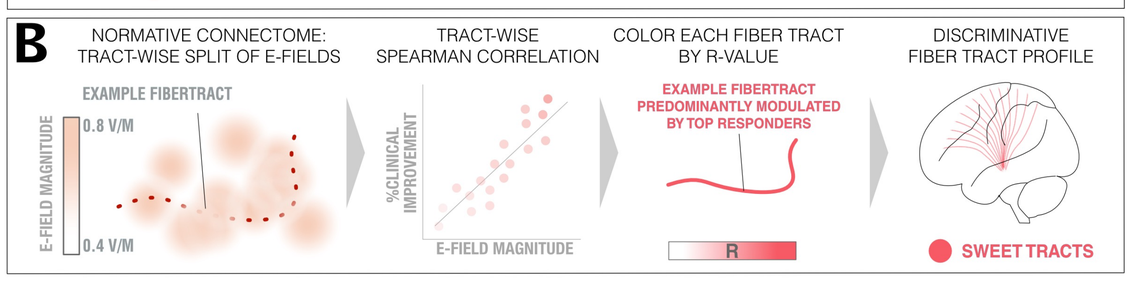
- **Patients:** 8 DBS patient cohorts from 7 centers – **dystonia** (DYT; N = 76), **Parkinson's disease** (PD; N = 95), **Tourette syndrome** (TS; N = 14), and **obsessive-compulsive disorder** (OCD; N = 19)

- **Clinical improvement:** **Burke-Fahn-Marsden Dystonia Rating Scale** (DYT), **Unified Parkinson's Disease Rating Scale–Part III** (PD), **Yale Global Tic Severity Scale** (TS), and **Yale-Brown Obsessive-Compulsive Scale** (OCD)

- **Methodological workflow:**
  (1) Reconstruction of precise DBS electrode placement and stimulation volumes (E-fields) using Lead-DBS software
  (2) **DBS Sweet-Spot Mapping** (**A**), **DBS Fiber Filtering** (**B**) and **DBS Network Mapping** (**C**) to identify voxels and *normative* tracts / cortical projection sites related to optimal clinical stimulation outcome per disorder







RESULTS

CONCLUSIONS

- By its impact on distributed networks, DBS is a meaningful tool to **functionally segregate the prefrontal cortex**.

- A functionally selective, caudo-rostral gradient of cortical organization is **mirrored within the subcortex** – in spatially compressed form.

- This **"information funnel effect"** may explain why DBS to **integrator hubs** (e.g., the STN) is an effective treatment for a variety of brain disorders of heterogeneous phenomenology.

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