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Adaptive Deep Brain Stimulation for Intractable Obsessive Compulsive Disorder

Wayne Goodman, MD, D.C and Irene Ellwood Professor and Chair of the Menninger Department of Psychiatry and Behavioral Sciences at Baylor College of Medicine, specializes in Obsessive-Compulsive Disorder (OCD) and Deep Brain Stimulation (DBS) for intractable psychiatric illnesses. He is the principal developer of the Yale-Brown Obsessive Compulsive Scale (Y-BOCS), the gold standard for assessing OCD, and co-founder of the International OCD Foundation, the major advocacy group for patients with OCD. Prior to joining Baylor, he held senior administrative positions at Mount Sinai Hospital in New York, NIMH and the University of Florida. He graduated from Columbia University with a degree in Electrical Engineering, received his medical degree from Boston University School of Medicine and completed his internship, residency, and research fellowship at Yale School of Medicine where he remained on faculty for 7 years. He has received numerous awards, published over 300 peer-reviewed papers and has a longstanding record of extramural research funding and is currently Principal Investigator on three grants from NIH's BRAIN initiative including one on developing Adaptive DBS for OCD.

Abstract: Background: Despite the promise of deep brain stimulation (DBS) targeting the ventral capsule/ventral striatum (VC/VS) for treating intractable obsessive-compulsive disorder (OCD), 25-40% of patients are non-responders. This may be due to the current 'open loop' stimulation paradigm, where constant stimulation does not address the dynamic nature of OCD symptoms. Adaptive deep brain stimulation (aDBS) has emerged as a potential strategy for improving efficacy of DBS for OCD. In an aDBS system, stimulation parameters are automatically adjusted based on detection of neural signatures related to symptoms or side effects of DBS (e.g., hypomania). Defining and capturing relevant behavioral states depends on the ability to continuously detect neural biomarkers in natural, ecologically valid environments. Until recently, opportunities for intracranial electrophysiological recordings in OCD patients have been limited to research settings. Methods: Herein, we present the first longitudinal collection of electrophysiology, behavior, and clinical evaluations from five participants with severe, refractory OCD treated with DBS as part of an ongoing

clinical trial towards developing aDBS for OCD. For the first time in patients with a psychiatric disorder, we demonstrate the utility of not only in-clinic, but also at-home collection of time-synchronized, multi-modal brain and behavioral data. Results: We have captured over 1000 hours of intracranial recordings during behavioral tasks and daily activities at home labelled with ecological momentary assessment of symptom state. Additionally, we conducted intracranial VC/VS recordings during Exposure and Response Prevention (ERP) teletherapy. Conclusions: Continued opportunities for long-term, naturalistic intracranial electrophysiological recordings will propel biomarker discovery and elucidation of neurocircuitry dynamics for OCD and other psychiatric disorders.