



UConn BIRC Speaker Series

Wednesday, April 3rd from 1:30–2:30pm in Arjona 307

****PLEASE NOTE THAT THIS TALK WILL NOT BE POSTED FOR LATER VIEWING ON THE BIRC WEBSITE****

Sequential control in the frontal cortex: studies in animals and humans

Theresa M. Desrochers, PhD, Brown University

Abstract: Performing sequential tasks such as making your breakfast are an integral part of daily life. The majority of previous studies have focused on motor sequences or non-sequential abstract control, rather than these kinds of more abstract sequential tasks. Our work using high-density multi-electrode chronic recordings in nonhuman primates has shown that an integrated cost-benefit signal in the striatum predicts the acquisition of habitual motor sequences. To move beyond motor sequences and address this gap in our knowledge of more abstract sequential tasks, we asked human participants to repeatedly perform simple four-item sequences of shape and color judgments during fMRI scanning. We found a novel dynamic in the rostralateral prefrontal cortex (RLPFC), where activation ramped up across the four items in each sequence and reset at the beginning of each new sequence. Transcranial magnetic stimulation (TMS) to RLPFC during the same task selectively produced an increasing pattern of errors as each sequence progressed, mirroring the fMRI activation. Effects in the RLPFC during fMRI and two independent TMS experiments dissociated from two other prefrontal control regions. These results show that RLPFC is necessary for sequential control and resolution of uncertainty during sequence performance. Current work focuses on dissociating some of the processes that underlie sequential task control: task execution, sequential monitoring, and sequence memory. Recent results show that ramping in the RLPFC is robust to changes in sequential stimuli and monitoring conditions, suggesting that these dynamics in the frontal cortex may be a common mechanism for tracking sequential information. New studies are focusing on investigating frontal cortical dynamics during sequential control in parallel nonhuman primate fMRI and multi-electrode recordings.



Bio: Dr. Theresa Desrochers is currently Assistant Professor in the Departments of Neuroscience and Psychiatry & Human Behavior at Brown University. She earned her PhD in Neuroscience from the Massachusetts Institute of Technology in 2011. There she trained with Dr. Ann M. Graybiel and co-developed a new method of performing high-density, reconfigurable recordings on awake-behaving nonhuman primates. For her postdoctoral fellowship, Dr. Desrochers worked with Dr. David Badre at Brown University where she discovered a novel brain dynamic that was necessary for the sequential executive functions. Dr. Desrochers joined the faculty of the Department of Neuroscience at Brown University in the fall of 2016. The Desrochers lab uses human and nonhuman primate models to investigate the neural underpinnings of sequential control. Work in the lab focuses on explicitly addressing these questions using a cross-species approach, which is rare in both human and nonhuman primate research. Current experiments are focused on using nonhuman primate fMRI, a technique that only a few labs are able to use, to explicitly bridge between human fMRI and nonhuman primate neural recordings and directly examine functional homology between the species.

Please email us if you would like to meet with Professor Theresa Desrochers.

Shuttle between UCHC & Storrs: transpo.uconn.edu/blank/uconn-health-center/

Remote access: ucsf.zoom.us/j/7384800369

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