Neural Prosthesis Seminar

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TMS for the study of Reaching and Connectivity in Healthy, Damaged, and Rehabilitated Brains

Understanding the link between brain structure and behavior has long been a goal of neuroscience and is a driving force behind the BRAIN Initiative. Because brain structures are damaged by disease and injury, and lead to changes in behavior, that understanding has the promise for pointing the way to effective treatments for behavioral deficits. Our long-term goal is better treatments for motor deficits after stroke, that would include both experience and neuromodulation. But until we understand how different regions of the brain connected to support normal function, it is hard to know how and when neuromodulation should be applied. We have undertaken a series of studies that examined how transcranial magnetic stimulation (TMS) can be used in the context of robotic rehabilitation to affect practice-related plasticity, work out role and timing of brain regions in control of movement. These studies have demonstrated, in part, the importance of premotor regions in the ongoing control of reaching movements – not only in their planning – and their increasing importance after stroke. This work has also led to a new direction, that of aggregating TMS-derived knowledge of brain circuitry into a specialized database that will allow exploration of brain circuitry with an emphasis on timing.

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