George F. Wittenberg, MD, PhD

Associate Professor, Neurology
University of Maryland, Baltimore

Biography:

After completing his PhD and MD at University of California, San Diego (1991 and 1993), Dr. Wittenberg continued his training at Mercy Hospital, Washington University, and National Institute for Neurological Disorders and Strokes (1994-2000) in Bethesda, MD. Dr. Wittenberg focuses on the use of robotic rehabilitation and uses TMS resources to perform mechanistic studies of the effect of repetitive task practice on motor cortex. Some of his contributions are sensorimotor integration and segmental specialization of sensory input in an invertebrate animal model. He has demonstrated the effectiveness of intensive arm training, with or without a robotic device to assist that training, in upper extremity motor impairments in chronic stroke, and the relationship of task difficulty to functional neuroimaging measures. He is known for recognizing that motor cortex maps in some children with cerebral palsy were shifted laterally.

Reaching, Robots and Rehabilitation; Brain Activity and the Effects of Practice

Many stroke patients remain dependent for some aspect of activities of daily living (ADL). Reaching in 3D to bring the hand to a point in space is an important element of ADL and is not a simple problem for the brain to solve in normal circumstances. Localization of reach control in both neurologically normal and affected individuals is of interest. While several cortical areas of importance have been identified, their relative contributions and precise role in time and space are unknown. These contributions can be probed by transcranial magnetic stimulation (TMS), a noninvasive and painless technology that delivers precisely timed pulses of electrical current to fairly localized brain regions. A single pulse of TMS generally interferes with function, but this depends on the state of the system. We found the most significant effects for dorsal premotor area stimulation, with a gradient of effect from proximal to distal movement over time. In a related study, we found the brain effects of practiced reaching movements can be influenced and probed with motor cortical TMS Stimulation during the late reaction time phase can increase the motor output accessed by TMS.