

Name of Organizer: Charles Liu, MD, PhD

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I am a current member of the ASNR (Symposium organizers must be ASNR members): Yes

Title of Symposium: Noninvasive Neuromodulation for Stroke Rehabilitation

Description of submitted symposium (please limit to 2000 characters): There has been tremendous interest and activity to understand the role of neuromodulation for the restoration of neurological function, for sensorimotor, as well as for speech and cognition. Indeed, researchers continue to examine deep brain stimulation for everything from minimally conscious states to movement disorders, as well as invasive brain cortical stimulation for stroke rehabilitation. Furthermore, there have been efforts to study the role of invasive spinal cord stimulation for spinal cord injury. While these efforts have demonstrated promise, the invasive nature of the approach has presented significant limitations for enrolling subjects in clinical trials, as well as for wide-spread application across the globe. Over the past few years, considerable interest has been generated surrounding the use of noninvasive approaches to stimulate and modulate brain and spinal cord function for therapeutic purposes. In fact, this concept is an area of significant emphasis in the ongoing BRAIN Initiative. Perhaps the two most promising approaches in noninvasive neuromodulation would be transcranial magnetic stimulation (rTMS) and transcranial direct current stimulation (tDCS). In this symposium, the role of neuromodulation in neurorehabilitation will be discussed, including how it may be integrated into current stroke rehabilitation paradigms. In addition, evidence for the efficacy of both rTMS and tDCS for therapeutic purposes will be reviewed, as well as the potential for each to become clinically useful in the near future. Furthermore, we will discuss advanced concepts in noninvasive neuromodulation algorithms. Finally, the requisite strategic collaborations between clinical neuroscientists and neurorehabilitation disciplines will be considered for developing the most effective treatments for stroke rehabilitation.

Length of time required for symposium?: 90 minutes

Additional Presenters (Limited to 4 additional presenters, list full name and email address) Please Note: Any Non-member speakers must receive prior approval from the Program Chair.: Carolee Winstein, PhD, PT, FAPTA; Winstein@usc.edu Richard L. Harvey, MD, rharvey@ric.org Sook-Lei Liew, PhD, OTR/L; sliew@chan.usc.edu

What is the role of each presenter?: Carolee Winstein: Traditional approaches in neurorehabilitation have used non-pharmacologic behavioral interventions such as task-oriented training to drive behavior change and indirectly, learning-dependent brain plasticity. However, several new approaches that rely on non-invasive brain stimulation (NIBS) show promise for neurorehabilitation. We will provide an overview of an ongoing systematic review of the effectiveness of NIBS for long term changes in behavior with relevance to neurorehabilitation. Richard Harvey: will discuss the theory behind rTMS in stroke rehabilitation, as well as clinical evidence for therapeutic benefit, using the experience with the NICHE Trial as a point of discussion. Sook-Lei Liew: Transcranial direct current stimulation is a rapidly growing neuromodulatory approach, due to its low cost, ease of use, and potentially strong effects. However,

there are still a number of unknown variables with using it in a clinical setting, such as the optimal dose (current amplitude, electrode location, duration and frequency of stimulation) and the high variability in effects among participants. We will discuss the theory behind tDCS in stroke rehabilitation, clinical evidence for its therapeutic benefits, and current limitations of this technique, along with newer or emerging methods in frequency-specific electrical stimulation and “high-definition” stimulation. Charles Y. Liu: will discuss advanced concepts of noninvasive neuromodulation, including algorithmic rTMS; consider the process of turning transformative discoveries into effective therapies, including the multidisciplinary collaborations between clinical neuroscience and neurorehabilitation disciplines across the complex healthcare landscape worldwide.

Objective 1: Describe the emerging role for neuromodulation as an adjuvant to rehabilitation after stroke.

Objective 2: Evaluate the progress of current clinical trials involving non-invasive neuromodulation strategies for stroke recovery.

Objective 3: Discuss advanced neuromodulation algorithms to enhance efficacy of non-invasive neuromodulation.