Cortical Activity During Reactive Balance Reflect Perceptual, Cognitive, and Motor Function in Health, Aging, and Disease

Featuring Dr. Lena Ting
Emory University

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PRESENTATION ABSTRACT

Engagement of cortical resources in balance control is an indicator of fall risk in older adults where people cannot “walk and talk” at the same time. However, there are few direct measures of cortical activity during balance control, and their relationship to balance and other brain functions is unclear. I will show evidence that various electroencephalography (EEG) measures of cortical activity during reactive balance recovery are associated with individual differences across perceptual, cognitive, and motor domains. Specifically, we focus on the N1 evoked response in balance perturbations, as well as beta oscillations prior to and in response to perturbations. Direct measures of cortical activity can stratify healthy young and older individuals without clinically identifiable impairment. Further, relationships between cortical activity and function differ as a function of age, balance ability, and neurological disorders such as stroke and Parkinson’s disease. The intersections across perceptual, cognitive, and motor domains may help identify complex mechanisms underlying balance function. Our findings suggest that direct measures of hierarchical balance control mechanisms could enable development of mechanistic, precision-medicine efforts aimed at fall prevention.

ABOUT DR. TING

Lena Ting is a Professor and the McCamish Distinguished Chair in Biomedical Engineering at the Coulter Department of Biomedical Engineering at Georgia Tech and Emory and a Professor in Rehabilitation Medicine in the Division of Physical Therapy at Emory University. Dr. Ting directs the Neuromechanical Laboratory at Emory, focusing on complex, whole body movements such as walking and balance in healthy and neurologically impaired individuals, as well as skilled movements involved in dance and sport. Her work is highly interdisciplinary, drawing from neuroscience, biomechanics, rehabilitation, computation, robotics, and physiology. Her lab has developed several computational methods to characterize and understand individual differences in movement and movement control, and how these change in neurological disorders, as well as with rehabilitation and training. Dr. Ting also co-directs the Georgia Tech and Emory Neural Engineering Center and an NIH T32 in Computational Neural Engineering. Dr. Ting is a Fellow of the American Institute of Medical and Biological Engineers (2016), she was awarded the Arthur C. Guyton Award for Excellence in Integrative Physiology by the American Physiological Society (2007), the Atlanta Business Chronicles, Healthcare Hero Award (2018) and several teaching and mentoring awards from Georgia Tech and Emory University.

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