UNIVERSITY of HOUSTON | ENGINEERING

Department of Biomedical Engineering

Friday, July 31st, 2020

11:00 AM

Defense held online via Zoom

Michael Houston

MS Thesis Defense

Dr. Yingchun Zhang, Faculty Advisor

"Altered Muscle Networks in Post-Stroke Survivors"

Abstract

Muscle networks represent functional interactions among muscles in the central nervous system's effort to reduce the redundancy of the musculoskeletal system in motor-control. How this occurs has only been investigated recently in healthy participants, yet the potential value of this method in characterizing the alteration of muscle networks after stroke remains unknown.

Muscle networks were assessed in mild, moderate, and severe stroke survivors and healthy control subjects to identify possible post-stroke alterations in the neural oscillatory drive to muscles. Surface electromyography (sEMG) was collected from eight key upper extremity muscles to non-invasively determine the common neural input to the spinal motor neurons innervating muscle fibers. Coherence was computed between all muscle pairs and further decomposed via non-negative matrix factorization (NMF) to identify the common spectral patterns of coherence underlying the muscle networks. Graph theory measures were calculated to quantify network topologies.

Results suggested that the number of identified muscle networks during force generation decreased with the heightened severity of stroke. Stroke patients showed reduced coherence in higher frequencies in the β and γ bands. The findings in this study could provide a new prospective for understanding the motor control recovery during post-stroke rehabilitation and inform future motor rehabilitation for post-stroke survivors.

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