Departments of Physical and Occupational Therapy present

Rehabilitation Science Dissertation Defense

Marzouq Almutairi
Candidate for PhD in
Rehabilitation Science
Final Dissertation Defense

UAB SCHOOL OF HEALTH PROFESSIONS
The University of Alabama at Birmingham

JOINT SPECIFICITY OF STRETCH SHORTENING CYCLE POTENTIATION

The stretch-shortening cycle (SSC) is a well-known phenomenon by which the performance of muscle during its shortening phase is enhanced due to preloading of muscle lengthening contraction. This enhanced performance of muscle due to SSC is also referred to as SSC potentiation. The biomechanical understanding of SSC potentiation is an area of active research for rehabilitation scientists. Currently, it is unknown whether SSC potentiation is a joint-specific event and shows a joint-specific temporal behavior. It is also unclear if constraints of joint and movement velocity specificity of SSC potentiation can be captured via an isokinetic dynamometer. Therefore, the purposes of this dissertation were to examine (1) joint specificity of SSC potentiation via isokinetic dynamometer, (2) kinetic-kinematic analysis of jump test performance, and (3) joint-specific temporal behavior of SSC potentiation. My first study examined the joint specificity of SSC potentiation by testing the knee extensors and plantar flexors separately under two conditions (with and without SSC) using isokinetic dynamometers at different movement velocities. It demonstrated that SSC is joint-specific and that ankle plantar flexors exhibited greater torque potentiation than knee extensors, independent of movement velocity. My second study assessed the joint specificity of SSC potentiation under three different conditions of jump test performance (JTP) using a motion capture and force plates system. Findings from this study showed that SSC is joint-specific during JTP and that, at the propulsive onset, the ankle joint extensor moment showed greater SSC potentiation than the hip and knee extensors. Finally, my third study aimed to further analyze the propulsive phase of JTP conditions to track the temporal change of the joint extensor moment potentiation over the peak propulsive phase, and whether enhanced JTP can be predicted by joint-specific extensor moment potentiation. Novel findings from our last study provided evidence of joint-specific temporal behavior of SSC potentiation during JTP. Although SSC potentiation of extensor moment was highest immediately at the onset of peak propulsive phase and progressively decreased across the peak propulsive phase for all the lower extremity joints; a considerable decline for this potentiation was noticed at the end of the peak propulsive phase for the ankle versus the hip and knee joints. Finally, our findings informed that hip extensor moment potentiation at the propulsion onset and the peak propulsive phase independently explained 67% and 71% of the variance in jump height enhancement. Whether these joint-specific and time-specific SSC potentiation are related to or can be used as a biomechanical marker of task efficiency remain to be examined.

EVENT DETAILS

Free to UAB students, faculty and clinicians.

DATE/TIME

Monday, July 12
10:00a-11:00a

LOCATION

https://zoom.us/j/91811105518?pwd=TVBoMGVLYXh5c2dJU2hLS2N2RUNZdz09

CONTACT

For more information contact Dr. Bill Reed.
934-3261
wreed@uab.edu

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