LOCALIZED FATIGUE CHANGES NEUROMUSCULAR ACTIVITY DURING LIFTING

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INTRODUCTION
Prolonged lifting may be associated with an increase injury risk due to fatigued muscles being less capable of reacting to any perturbations that occur during a lift. Repetitive muscle use leads to reduced functional capacity, known as fatigue. In lower force tasks, fatigue is an ongoing process which may result in increased perceived effort and a reduction in the maximal force generating capacity of a muscle [1]. This study investigated the neuromuscular changes in a general and two local fatiguing lifting protocols.

METHODS
Thirteen university students performed a lifting task consisting of lifting a box weighing 10% of a lift specific maximal voluntary isometric exertion (MVIE) from the floor to a chest height shelf at a rate of 6 lifts per minute. The lifting task was performed under three different fatiguing conditions (general, back and shoulder) on separate days. Prior to the lifting conditions, the participants completed trunk extension and shoulder flexion MVIEs. General fatigue consisted of 75 minutes of consecutive lifting. Shoulder and back fatigue consisted of 5 minutes of baseline lifting followed by a shoulder or back fatigue protocol, respectively and then 5 minutes of post-fatigue lifting. Borg perceived level of exertion was collected throughout the lifting protocols. Trunk extension and shoulder flexion MVIE protocols were repeated at the end of the lifting trials.

Electromyography electrodes were placed on the anterior deltoid (AD), posterior deltoid (PD), upper trapezius (UT), long head of biceps brachii (BI), lateral head of triceps brachii (TRI), erector spinae at the thoracic (T8) and lumbar (L5) levels. Paired samples t-tests were used to identify significant changes (p<0.05) in MVIEs, lift times, Borg perceived exertion, integrated EMG (IEMG), Peak EMG and time to peak RMS normalized to a percentage of the lift time (relative time to peak).

RESULTS

Maximum Voluntary Isometric Exertions. There was a significant decrease in the MVIEs for both trunk extension and shoulder flexion following all 3 conditions (Figure 1).

Borg perceived exertion. A significant increase in perceived exertion was observed for all conditions. The greatest increase was in the general protocol with an average increase of 6 points followed by the shoulder and back with average increases of 4.8 and 3.8 respectively.

Lift Time. A significant decrease of 13 seconds in lift time was observed in the general fatigue protocol.

IEMG. The general fatigue protocol resulted in significant decreases in the AD, BI, T8 and LD muscle activation. A significant decrease in AD IEMG was also found in the shoulder fatigue protocol.

CONCLUSIONS
The results indicate that neuromuscular adaptations that occur during fatiguing tasks are complex and are a direct result of the type and location of fatigue within the neuromuscular system.

REFERENCES