TACSM Abstract

Intermuscular Coherence of Rotator Cuff and Deltoid Muscles Varies with Force Output

XIN. YU, HUIYING. ZHU, LINDSEY. HAMMOND, & LISA. GRIFFIN

Neuromuscular Physiology Research Laboratory; Department of Kinesiology and Health Education; University of Texas at Austin; Austin, TX

Category: Doctoral

Advisor / Mentor: Griffin, Lisa (l.griffin@austin.utexas.edu)

ABSTRACT

Maintaining glenohumeral joint stability requires coordination of the rotator cuff and deltoid muscles. Load changing may alter the neuromuscular control patterns between these two muscle groups. **PURPOSE**: To identify intermuscular EMG coherence patterns between the rotator cuff and deltoid muscles at different force levels. **METHODS**: Surface EMG electrodes were used to record activity from the anterior deltoid (AD), middle deltoid (MD), and infraspinatus (IS) muscles of the dominant shoulder in 7 healthy individuals (mean age ± SD = 19±1, 6 females, 1 male). An intramuscular fine-wire EMG electrode was inserted into supraspinatus (SS). Participants performed 30s contractions of isometric shoulder abduction in the scapular plane at 30° at 25% (low-load), 50% (medium-load) and 75% (high-load) of maximum voluntary contraction with visual feedback of the force output. EMG amplitudes and coherence of each muscle pair in the common drive (0-5 Hz), physiological force tremor (5-12 Hz), beta (15-35 Hz), low-gamma (35-60 Hz) and high-gamma (60-100 Hz) bands were compared across the 3 force levels. **RESULTS**: EMG amplitudes of all muscles increased as force level increased (all $p<0.05$). EMG coherence between IS and deltoid muscles increased as force level increased in the low-gamma band ($p<0.05$). SS-IS coherence was also the highest during high-load task in the low-gamma band. These data indicate that additional neural drive with higher force levels stemming from subcortical origin likely mediate the increase in coherence between these muscles. However, SS-IS coherence during the medium and high load tasks were lower than that during the low-load task in the common drive band ($p<0.05$), indicating that the increase in drive to these muscles for increasing force output is not targeted at common last-order neurons. Similarly, SS-AD coherence during the high-load task was lower than that during the medium-load task in the beta band ($p<0.05$). SS-AD ($P<0.05$) and SS-MD ($P<0.01$) coherence under medium load were lower than that under low load in tremor band. The reduction in coherence between the SS and deltoid muscles and the SS and IS may serve to protect the humeral head from migrating superiorly at higher force loads. **CONCLUSION**: Increasing force output led to decreased coherence within the rotator cuff muscles and between supraspinatus and the deltoid muscles, but increased coherence between infraspinatus and the deltoid muscles. This likely serves as a protective mechanism against superior humeral head migration.