

Differences in Load Response of Rotator Cuff and Deltoid Muscles in Younger and Older Adults

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ABSTRACT

Shoulder health is essential for the independence of older adults. Many older adults suffer from impairment of shoulder mobility, yet it is unknown how neuromuscular activation patterns in the shoulder change with age. **PURPOSE:** To analyze electromyographic (EMG) coherence in the delta band (2-5 Hz) - a measure of common drive from the central nervous system related to force output - to the rotator cuff and deltoid muscles in younger and older adults during low, med and high force levels. **METHODS:** Eighteen younger adults (YA) (11 males, 25 ± 5 years) and 6 older adults (OA) (3 males, 72.7 ± 8 years) were recruited. Intramuscular EMG was recorded from the supraspinatus muscle (SS); surface EMG was recorded from the middle deltoid (MD) and infraspinatus (IS) muscles. Participants performed 30-sec isometric contractions at 30° scaption at 25%, 50%, and 75% of maximal voluntary contraction (MVC) in random order. Z-transformed pooled coherence of three muscle pairs (SS-IS, SS-MD, IS-MD) were compared using a two-way repeated measures ANOVA (group x force) with Bonferroni post-hoc analysis. **RESULTS:** There was a significant main effect for the group ($p = .014$) for the SS-MD pair. YA had greater coherence during the 75% MVC (0.29 ± 0.04) than the 25% MVC (0.18 ± 0.02) ($p = 0.001$). There were no significant differences between contraction intensities for the OA (OA avg. = 0.12 ± 0.02 ; [$0.11 \pm .02 - 0.10 \pm .05 - 0.15 \pm .04$]). For the SS-IS pair, there was a main effect of force ($p = .011$) and a group x force interaction ($p = 0.008$): YA had greater coherence at 75% MVC ($0.31 \pm .025$) than at 50% MVC (0.14 ± 0.03 , $p = .009$) and 25% MVC ($0.17 \pm .03$, $p = .007$); whereas, OA showed no significant differences across force levels (25% MVC: $0.10 \pm .03$, 50% MVC: $0.18 \pm .03$, 75% MVC: $0.14 \pm .03$). No significant differences were found in the IS-MD pair across loads in either group (YA avg. = $0.27 \pm .04$; OA avg. = $0.14 \pm .04$). **CONCLUSION:** Overall, younger adults have more common drive to the rotator cuff and deltoid muscles than older adults across all force levels. The lack of response of common drive to changing force levels in older adults reflects age-related changes in neuromuscular control that could affect shoulder joint integrity.