

Muscle Activity Comparison Of Four Common Shoulder Exercises In Unstable And Stable Shoulders.

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This study examined shoulder muscle electromyographic (EMG) activity while subjects performed four specific exercises to determine differences between unstable and stable subjects. Fifteen subjects with instability and 5 matched volunteers participated in this study. Subjects were classified as having multidirectional instability (MDI), anterior instability (AI), generalized laxity (GL), and stable based on one orthopedic surgeon's evaluation. The purpose of this study was to determine if electromyographic activity of shoulder musculature was significantly different between the four groups while performing four common shoulder exercises. Indwelling electrodes were used to study supraspinatus, infraspinatus, and teres major activity while surface electrodes were used for the serratus anterior, middle deltoid, and upper trapezius. EMG activity was normalized to maximal voluntary isometric contraction for comparison across subjects. A cuff weight representing 25% peak force was used to provide resistance during scaption, prone horizontal abduction (PHA), and prone external rotation (PER) exercises. A kneeling push-up with a plus was completed with no additional resistance. The root mean squared amplitude was determined for each muscle at 30° arcs for all exercises performed. A nonparametric Kruskal-Wallis analysis was used due to small sample size ($n = 5$). Differences in EMG amplitudes at each arc were compared between all groups. For significant differences a follow up multiple comparison post hoc analysis was performed with alpha level set at $p \leq 0.05$. MDI subjects had a significant increase of activity in teres major activity during a push-up plus compared to all other groups ($p < .05$). MDI and GL subjects had significant increased activity in the upper trapezius during scaption in the initial and final 30° arc ($p < .05$). PER effectively activated the infraspinatus with no differences between groups. Scaption and PHA effectively activated the supraspinatus with no differences between groups. The subjects with AI demonstrated a trend of decreased activity throughout all exercises studied compared to other groups. These findings support that exercises can be tailored to activate specific muscles regardless of shoulder instability. Findings suggest that AI subjects experience some muscle inhibition during specific exercises that stress the anterior capsule. In subjects with MDI, a general increase in muscle activity could indicate more dependence on dynamic stabilizers supporting the use of shoulder rehabilitation to manage instability. Continued investigation to increase number of subjects is necessary to assess emerging trends.