ABSTRACT

Background: Hyperactivity of the anterior deltoid (AD) has been shown to produce adverse effects on subacromial space width as a result of humeral head superior translation during rehabilitation exercises used with overhead athletes. Also, the importance of the ratio of upper trapezius (UT) to lower trapezius (LT) muscle activity has been examined during rehabilitation exercises particularly for those who develop scapular dyskinesis.

Hypothesis/Purpose: The purpose of this study was to investigate the level of LT and SA muscle activity during scapular plane elevation (scaption) in three positions while maintaining a moderate level of AD muscle activity. A secondary purpose was to identify the ratio of UT to LT muscle activity during the varied scaption exercises. The authors hypothesized that the activation of these two important muscles and the UT/LT ratio would vary with exercise position and throughout the range of scapular plane elevation.

Methods: Fourteen active young subjects performed scaption exercises in three different positions: standing (STAN), quadruped (QUAD), and prone (PRON) with three different weight loads: 0 kg, 1.8 kg, and 4.1 kg. Surface electromyography (EMG) was used to record muscular activity. Tested muscles included the UT, LT, SA, AD, and posterior deltoid muscles on the dominant side.

Results: QUAD scaption exercises with a load of 1.8 kg at 4 sec after the initial movement activated the LT muscle up to 49% of maximum voluntary isometric contraction (MVIC) while maintaining a moderate level of AD muscle activity (30% MVIC). STAN scaption exercises with the weight load of 1.8 kg at 3 sec after the initial movement activated 43% MVIC of the SA muscle while maintaining a moderate level of AD muscle activity (39% MVIC). The PRON condition generated significantly less SA muscle activity with both 1.8 and 4.1 kg weight loads than during the QUAD condition. The ratios of UT to LT muscle activity were significantly less in QUAD than those of STAN up to 4 sec after the initial movement. No significant difference was observed in the UT/LT ratio between QUAD and PRON conditions.

Conclusion: QUAD scaption exercise effectively activated both LT and SA muscles without over activating the AD and produced favorable ratios of UT to LT muscle activity.

Level of Evidence: Descriptive Cohort Study, Level 4

Keywords: Electromyography, lower trapezius, scapular plane elevation, serratus anterior, upper trapezius