

SYSTEMATIC REVIEW

A SYSTEMATIC REVIEW OF THE EXERCISES THAT PRODUCE OPTIMAL MUSCLE RATIOS OF THE SCAPULAR STABILIZERS IN NORMAL SHOULDERS

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Purpose: The purpose of this systematic review was to determine the exercises that optimize muscle ratios of the periscapular musculature for scapular stability and isolated strengthening.

Methods: A systematic search was performed in PubMed, CINAHL, SPORTDiscus, Scopus, and Discovery Layer. Studies were included if they examined the muscle activation of the upper trapezius compared to the middle trapezius, lower trapezius, or serratus anterior using EMG during open chain exercises. The participants were required to have healthy, nonpathological shoulders. Information obtained included maximal voluntary isometric contraction (MVIC) values, ratios, standard deviations, exercises, and exercise descriptions. The outcome of interest was determining exercises that create optimal muscle activation ratios between the scapular stabilizers.

Results: Fifteen observational studies met the inclusion criteria for the systematic review. Exercises with optimal ratios were eccentric exercises in the frontal and sagittal planes, especially flexion between 180° and 60°. External rotation exercises with the elbow flexed to 90° also had optimal ratios for activating the middle trapezius in prone and side-lying positions. Exercises with optimal ratios for the lower trapezius were prone flexion, high scapular retraction, and prone external rotation with the shoulder abducted to 90° and elbow flexed. Exercises with optimal ratios for the serratus anterior were the diagonal exercises and scapular protraction.

Conclusion: This review has identified optimal positions and exercises for periscapular stability exercises. Standing exercises tend to activate the upper trapezius at a higher ratio, especially during the 60-120° range. The upper trapezius was the least active, while performing exercises in prone, side-lying, and supine positions. More studies need to be conducted to examine these exercises in greater detail and confirm their consistency in producing the optimal ratios determined in this review.

Level of evidence: 1a

Keywords: Electromyography, electromyography feedback, resistance training, serratus anterior, trapezius

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Note: Abbey Schory, Erik Bidinger, and Joshua Wolf were student physical therapists under the direction of Dr. Murray when this project was completed.