Scapular Stabilizer Excitation During Arm Elevation Does Not Differ Between Younger and Older Males and Females.

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Summary

The increased prevalence of shoulder pain with aging and in females may be the result of biomechanical changes resulting from differing scapular stabilizing muscle excitation between the sexes and young and older adults. The current study found no difference in serratus anterior (SA) and upper (UT), middle (MT), and lower trapezius (LT) excitation between older and younger males and females during the raising phase of a loaded shoulder flexion task. Interestingly, older males had significantly greater SA excitation than younger males. Results of this cross-sectional study suggest that differences in excitation of the scapular stabilizers do not differ systematically between the sexes and that SA excitation may increase with aging in males.

Introduction

Shoulder pain increases with aging [1] and is more common in females [2] which may be due to biomechanical differences between the sexes and younger and older adults. While variations in scapular muscle excitation have been reported between different ages [3] and are consistently reported between those with and without shoulder pain [4], few studies have examined differences in scapular muscle excitation between the sexes in younger and older adults. The current study defined excitation of the serratus anterior (SA) and upper (UT), middle (MT), and lower trapezius (LT) between older and younger males and females during the raising phase of shoulder flexion.

Methods

Fifty-two participants [14 older females (OF; 65± 4 years), 10 older males (OM; 65± 5 years), 13 younger females (YF; 25± 6 years), and 15 younger males (YM; 24± 3 years)] attended one experimental session where they performed maximal voluntary isometric contractions (MVIC) in two adapted Kendall muscle testing positions for the SA and trapezius [5]. Participants also performed 3 repetitions of maximal isometric shoulder flexion (MISF) with the elbow straight and shoulder at 90º of sagittal plane flexion. Participants then performed 5 repetitions of dynamic shoulder flexion in the sagittal plane holding a load corresponding to 30% of their MISF. High density surface electromyography (EMG) of the UT, MT, and LT, and bipolar EMG of the SA was collected during the MVICs and dynamic contractions from each participant's dominant shoulder. Four 2-way (sex*age) ANOVAs compared RMS of each muscle (SA, UT, MT, LT) during the raising phase of the dynamic shoulder flexion task.

Results and Discussion

There was no interaction or main effects for age or sex on SA, UT, MT or LT excitation. There was a significant main effect for age (p<0.05) on SA excitation. Pairwise comparisons revealed that SA was significantly higher in older than younger males (p=.031), but not between younger and older females (p=.520; Table 1).

While previous studies report differences in scapular muscle excitation between younger and older adults [3], results of the current study and others [6] suggest that differences in excitation may not explain differences in rates of shoulder pathology between older and younger adults. Future longitudinal studies should define if biomechanical factors such as muscle excitation and kinematics change systematically with aging and pain and their relation to each other and shoulder pathogenesis.

Conclusions

Muscle excitation of the serratus anterior, upper, middle and lower trapezius does not differ between younger and older males and females. Differences in serratus anterior excitation between younger and older males should be explored further as it may contribute to shoulder pathology in older males.

Acknowledgments

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References

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Table 1: Mean (standard deviation) excitation (% of maximum voluntary contraction) of the serratus anterior (SA), upper (UT), middle (MT) and lower trapezius (LT) during the arm elevation tasks. *Significantly different (p<.05) than younger males.

	Older Males (n=10)	Older Females (n=14)	Younger Males (n=15)	Younger Females (n=13)
SA	65.7 (25)*	55.5 (26)	47.1 (20)	50.0 (18)
UT	68.6 (12)	72.5 (18)	64.0 (21)	60.9 (19)
MT	33.6 (12)	44.3 (23)	35.3 (26)	36.0 (18)
LT	47.8 (25)	55.5 (11)	43.1 (16)	50.7 (15)