

EFFECTS OF A 6-MONTH YOGA PROGRAM ON SCAPULAR POSTURING IN OLDER ADULTS WITH HYPERKYPHOSIS

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INTRODUCTION

Hyperkyphosis, or an increased thoracic curvature, is a common posture syndrome in older adults. This excessive curvature is related to decreased functional capacity, including rising from a chair, bending and reaching (Ryan, 1997; Kado, 2005). These functional capabilities, however, were improved by Yoga intervention (Greendale, 2002). Scapular posture is also affected by thoracic curvature (Kebaetse, 1999 and Finley, 2003); yet it is unknown if Yoga intervention may improve scapular posturing, especially in older subjects diagnosed with hyperkyphosis. The purpose of this study was to quantify the change in scapular posturing during static (sitting and standing) and dynamic (walking) tasks, following completion of a 6-month Yoga program.

METHODS AND PROCEDURES

Eighteen older adults (75.4 ± 7.3 yrs) with hyperkyphosis ($52.2^\circ \pm 9.4^\circ$) participated in this study. Hyperkyphosis was defined by Debrunner kyphotic angle greater than 40 degrees. At baseline, subjects were instrumented for motion analysis with reflective markers placed on the spinous process of the 7th cervical vertebra (C7), sternal notch (St), and bilateral acromion processes (RA, LA). They were then asked to perform 4 tasks: 1) quiet-standing, 2) normal walking, 3) fast walking, and 4) sitting, in a randomized order, while recorded by an 8-camera motion analysis system (Vicon 612,

Oxford, UK). Following the baseline measurement, subjects participated in a Hatha yoga program, 3 times per week for 24 weeks. The program focused on poses intended to improve strength, increase flexibility, and restore upright posture. Motion analysis was repeated after 6 months. Scapular posturing was quantified by protraction index, calculated by the following formula, where a greater value indicates greater protracted scapular posturing.

$$\text{Protraction Index} = [(distance\ from\ C7\ to\ RA) + (distance\ from\ C7\ to\ LA)] / [(distance\ from\ St\ to\ RA) + (distance\ from\ St\ to\ LA)]$$

Paired t-tests were used to test the difference in protraction index between baseline and 6-month follow-up. Since walking is a dynamic task and the protraction index varies with gait cycle, the maximum, minimum, and averaged protraction index during a complete gait cycle were obtained. The difference between maximum and minimum was also calculated as a measure of scapular excursion.

RESULTS

Statistical results demonstrated significant improvements (2.9%) of scapular posturing in the static sitting condition after 6 months of yoga intervention ($p < 0.05$) (Table 1). A similar trend of a decrease in protraction index was also observed during static standing, but did not reach statistical significance ($p = 0.059$). During dynamic walking, the subject's scapulae were statistically significantly less protracted

during the maximum protracted phase for both normal ($p < 0.05$) and fast ($p < 0.05$) walking, following the yoga intervention. However, no significant differences were found during the minimum protracted phase of gait. The average protraction index of the entire gait cycle decreased significantly during normal walking ($p < 0.05$) but only decreased at a borderline significant level during fast walking ($p = 0.053$). The overall excursion of the protraction index during gait decreased significantly after the 6-month yoga intervention for both fast and normal walking. This is primarily due to the significantly less protracted posture during the maximum protracted phase and relatively unchanged posture during the minimum protracted phase after the yoga intervention.

DISCUSSION AND SUMMERY

Findings of this study suggest that the 6-month yoga program improved scapular posturing, to a less protracted position, during both static and dynamic conditions. The scapulae were also more stable, as indicated by a significantly decreased scapular excursion, during both normal and fast walking. Abnormal scapular positioning may

decrease the subacromial space and consequently increase the risk of impingement syndromes (Lukasiewics, 1999; Michner, 2003). This study demonstrated that the yoga intervention effectively improved scapular posturing in older adults with hyperkyphosis.

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Table 1. Protraction index during static sitting, static standing, normal walking and fast walking

	Baseline	Follow-up	P-value
Static Sitting	1.068 (0.049)	1.037 (0.065)	0.001
Static Standing	1.051 (0.048)	1.040 (0.059)	0.059
Normal Walking			
Maximum	1.037 (0.043)	1.017 (0.051)	0.014
Minimum	1.020 (0.042)	1.022 (0.052)	0.685
Average	1.028 (0.043)	1.011 (0.052)	0.020
Change	0.017 (0.006)	0.012 (0.005)	0.005
Fast Walking			
Maximum	1.043 (0.044)	1.029 (0.046)	0.026
Minimum	1.015 (0.042)	1.009 (0.052)	0.197
Average	1.030 (0.043)	1.019 (0.048)	0.053
Change	0.028 (0.010)	0.021 (0.014)	0.035

Mean (SD)