ABSTRACT

Background: The stabilizing action of the serratus anterior (SA) muscle is vital in maintaining normal scapulothoracic rhythm. This warrants investigation of exercises to discern which are best to activate the SA muscle. Recruitment of the muscles in the trunk and lower extremity kinetic chain during exercises has demonstrated increased SA activation due to the myofascial connections between various segments of the body. Variation of surfaces during an exercise has also been shown to alter the muscle recruitment patterns.

Purpose: The primary purpose was to determine the effects of trunk and lower extremity kinetic chain muscle recruitment on the SA muscle activity while on an unstable surface. The secondary purpose was to determine if the SA muscle activity would change when the surface stability during the exercises was reduced.

Study Design: Descriptive, within-subject repeated measures.

Methods: Surface electromyographic activity of the SA, latissimus dorsi (LD), external oblique (EO) on the dominant, and femoral adductor (FA) muscles on the non-dominant side and gluteus maximus bilaterally was analyzed during forward punch plus (FPP) and two of its variations: FPP with closed chain serape (CS), FPP with open chain serape (OS) on stable and unstable surface in twenty-one healthy males. A two-way repeated measure ANOVA was used to determine the difference in the muscle activation between exercises, surfaces, and interaction between these two variables. A separate one-way repeated measures ANOVA with Sidak post hoc test was used for comparisons between stable and unstable surfaces. (p≤0.05).

Results: Muscle activity was statistically significantly higher for the CS and the OS exercises compared to the FPP for all the muscles except for the LD within the same surface. There was no significant difference in muscle activity for any of the muscles when compared between stable and unstable surfaces.

Conclusions: Incorporating the trunk and lower extremity kinetic chain during the FPP exercise increased the SA activation on both stable and unstable surfaces. However, the type of surface did not influence the activation of any muscle across exercises. The results of this study further strengthen the benefit of the kinetic chain exercises but also caution that adding an unstable surface to an exercise does not always imply higher muscle activation.

Level of Evidence: 2b

Key Words: Kinetic chain, serratus anterior, movement system, myofascial chains