ABSTRACT

Background: Prolonged and repetitive overhead use of the arm, such as during the volleyball serve, has been linked to overuse injuries.

Purpose: To examine changes in activation of the infraspinatus and lower trapezius following performance of repetitive jump-float serves.

Study Design: Descriptive Cohort study.

Methods: Six asymptomatic female Division I college volleyball players (age = 19.2 ± 1.1 years, height = 182.9 ± 2.5 cm, weight = 82.1 ± 12.2 kg) performed 87 jump-float serves in 13 intervals of seven serves each on an NCAA regulated indoor volleyball court. Electromyography (EMG) electrodes were connected to TeleMyo DTS wireless sensor with the DTS EMG lead sampling at 1000 Hz. Dependent variables included Median Power Frequency (MPF) of the infraspinatus (IF) and lower trapezius (LT), as well as rating of perceived exertion (RPE), perceptual fatigue measured using the Borg scale, and heart rate (HR). Paired t-tests were performed to examine differences in variables between interval 1 (serves 1-3) and interval 13 (serves 85-87). Pearson’s r Correlation Coefficients were calculated to examine relationships between the dependent variables across all 13 intervals.

Results: IF MPF demonstrated a significant and clinically meaningful decrease from interval 1 to interval 13, indicating muscular fatigue. The decrease in LT MPF from interval 1 to interval 13 was not statistically significant, though it met criteria for clinical meaningfulness and was underpowered. RPE and perceptual fatigue were strongly correlated (r = 0.889, p < 0.01) as were RPE and HR (r = 0.679, p < 0.01) and HR and fatigue (r = 0.631, p < 0.01). IF MPF was weakly related to LT MPF (r = 0.227, p < 0.05). LT MPF was weakly related to RPE (r = 0.352, p < 0.01), perceptual fatigue (r = 0.313, p < 0.01), and HR (r = 0.322, p < 0.01).

Conclusions: Repeated overhead jump-float serves, common in volleyball players, required high effort and induced clinically meaningful muscular fatigue that was not perceived by the participant. Significant changes were observed in IF MPF and percent change and effect size suggest that a meaningful change occurred in LT MPF related to jump-float serving.

Level of Evidence: 2.

Key Words: electromyography, fatigue, glenohumeral joint, movement system, volleyball

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