TITLE: Reliability and Hamstring Activation during Rotational Dynamic Postural Stability in Healthy Recreational Athletes
SECTION: Sports
PRESENTATION TYPE: Research Report - Poster
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ABSTRACT BODY:
**Purpose/Hypothesis:** To develop a postural stability task to challenge rotational knee stability and differentially activate the hamstrings musculature. We hypothesized that the postural stability and hamstring musculature activation would be different depending on rotation direction.

**Subjects:** Test-retest reliability was examined using 14 healthy, recreational athletes (age = 20.9 ± 1 years, height = 172.1 ± 10.9 cm, weight = 73.3 ± 16.1 kg). Another 19 healthy, recreational athletes (age = 22.1 ± 3.2 years, height = 171.9 ± 8.8 cm, weight = 74.8 ± 12.2 kg) voluntarily participated in the surface electromyography (EMG) analysis study.

**Material/Methods:** Each subject completed 3 successful medial and lateral rotational jumps with respect to the medial and lateral aspect of the tested knee. Each jump included a forward broad jump over a 12-inch hurdle; a 90-degree rotation; and a landing on a force plate that was located 40% of the subject’s height from the starting point. The dynamic postural stability index (DPSI) and component scores were calculated based on ground reaction forces immediately following initial contact (3 seconds). Muscle activation was recorded for the medial and lateral hamstrings to determine if any differential activation occurred between rotation directions. The integrated EMG during 150ms prior to and after initial contact and from initial contact to peak knee flexion (landing phase) was calculated following normalization of the signal (normalized to maximal voluntary isometric contraction). The test-retest reliability for the postural stability score was calculated using the ICC model (2,1). The Wilcoxon Rank-Sum test was used to compare muscle activation and DPSI scores between. Statistical significance was set at p<0.05 a priori.

**Results:** The two tasks demonstrated moderate to good test-retest reliability (ICCs = 0.670 – 0.863). Lateral rotation elicited a higher medial-lateral stability index score (0.141 vs 0.135 respectively, p<0.001). No significant difference in pre-activity or reactivity of the hamstring musculature was detected between tasks. However, the lateral rotation task elicited significantly greater lateral hamstrings muscle activation through the duration of the landing phase (p<0.05).

**Conclusions:** The rotational postural stability tasks are reliable with the lateral rotation task eliciting higher postural stability scores. Healthy, active individuals do differentially activate the hamstring musculature during the landing phase of rotational jump landings.

**Clinical Relevance:** No differentiation was detected during the pre-activity or reactivity surrounding initial contact. However, increased overall lateral hamstring activation was detected during the landing phase. These findings may indicate that subjects where not selectively activating the hamstrings musculature until weight acceptance in the landing phase. Future studies should investigate the difference in activation patterns during rotational landing between healthy and ACL deficient athletes as a potential coping strategy.
Keywords: Muscle Activation, Hamstrings, Landing, Postural Stability
Character Count: 3118/3125