Influence of dorsiflexion range of motion on Star Excursion Balance Test reach distances

**Context:** The Star Excursion Balance Test (SEBT) is a clinical balance test that has been shown to be a valid outcome tool for identifying dynamic balance deficits associated with lower extremity injury. SEBT performance is a combination of strength, neuromuscular control, and joint ROM; however it is unclear how these individually contribute to performance. Of all the factors investigated in SEBT performance, ankle dorsiflexion ROM (DROM) appears to be critical in at least one of the reach directions. DROM deficits are a risk factor for LE injuries, and clinicians have begun to use the SEBT to assess such risk factors.

**Objective:** The purpose of this study was to validate the evidence associated with the relationship between ankle DROM and reach direction within the SEBT.

**Design:** Cross-sectional study.

**Participants:** Twenty-eight healthy adults (15 males, 14 females, age: 19.8 ± 1.0 years, height: 171.4 ± 12.3 cm, weight: 78.7 ± 22.6 kg) participated in this study. All subjects were free of any musculoskeletal and neurological injuries, and reported no disability that would impair their balance. Prior to participating in the study, all subjects provided written informed consent. Similar subject size and demographics were seen in other studies.

**Intervention:** All subjects performed 3 trials of the anterior (ANT), posteromedial (PM), and posterolateral (PL) directions of the SEBT on both the dominant (preferred kicking limb) and nondominant limbs. As well, all subjects performed 3 trials of the weight-bearing lunge test (WBLT) to measure the maximum weight-bearing DROM on each limb. The mean of the 3 trials for each variable was used for analysis.

**Main Outcome Measure:** Pearson’s product moment correlation coefficients were calculated between the WBLT and the three directions of the SEBT. Alpha was set a priori at p<0.05. Because there were no differences between the dominant and non-dominant limbs on any of the dependent variables, the right and left reach distances were pooled for analysis.

**Results:** There was a moderate correlation between the WBLT (9.6±3.4cm and the ANT reach (69.4±6.8cm, r=0.55, r²=0.30, p<0.01). However, weak correlations were found between WBLT and the PM (82.0±8.8cm, r=0.29, r²=0.08, p=0.14) and the PL (74.8±10.4cm, r=0.29, r²=0.08, p=0.14) reaches.

**Conclusions:** Weight-bearing dorsiflexion explained approximately 30% of the variance in ANT reach direction whereas it only explained 8% of the variance in the posterior directions. Our findings directly support the previously published evidence and help to further the validity of the relationship between weight-bearing dorsiflexion and performance on the anterior reach of the SEBT. Since decreased DROM has been shown to be a contributing factor to other LE injuries, our study provides additional evidence to support using the SEBT as a clinical tool to assess lower extremity injuries.

**Word Count:** 446