

## **The Role of Foot Position in Postural Stability and Balance**

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### **PURPOSE:**

The use of assessing the quality and accuracy of task specific movement patterns to identify deviation in posture, balance and dynamic movement or to note improvement with an intervention is becoming more prominent in the literature. It is unclear if the foot position at the time of assessment would influence the quality of the movement pattern. The purpose of this study is to determine if foot position would effect dynamic postural balance as measured by the translation of the center of pressure using the *MatScan*<sup>®</sup> System (Tekscan).

### **METHODS:**

A repeated measures design was used testing subjects under two conditions, (1) self-selected foot position (SSFP) and (2) standardized biomechanical foot position (SBFP) (15 deg of ER and 6 inches between the bisection of the calcaneous). Testing occurred in a controlled laboratory setting in a single session. Twenty subjects (10 males and 10 females), mean age  $21 \pm 1.3$  yrs, mean height  $168.6 \pm 8.1$  cm and mean weight of  $73.05 \pm 14.92$  kg participated in this study. The force data was collected at 40 Hz. using the *MatScan*<sup>®</sup> System (Tekscan). Subjects were instructed to squat to 60 degrees of knee flexion in two seconds guided by audio cues from the researcher of “ready, set, down, up” in conjunction with a metronome while standing on the *MatScan*<sup>®</sup>. Real time data acquisition tracking the translation of the center of pressure during the squatting movement was then used to calculate the variables of Area, Distance and Variability. Area, thought to reflect postural sway, represents the translation of the COF using X and Y excursions and the formula for an ellipse. Distance represents the total excursion of the COF (calculated using the Pythagorean Theorem) across the selected duration of time and represents overall postural adjustments. Variability is the standard deviation of the moment to moment distances and is thought to reflect fine postural adjustments.

### **RESULTS:**

There were statistical significant differences between SSFP and the SBFP for both Area ( $p = 0.005$ ;  $t_{19} = -3.208$ ) and Distance ( $p = 0.004$ ;  $t_{19} = -3.289$ ). For Area (representing postural sway), the mean value for SSFP was  $12.04 \pm 5.83$  cm<sup>2</sup> and  $8.71 \pm 2.67$  cm<sup>2</sup> for the BSFP, a 27.66% decrease. For Distance (representing overall postural adjustments), the mean value for SSFP was  $19.43 \pm 3.82$  cm and  $17.35 \pm 2.48$  cm for the BSFP, a 10.71% decrease.

### **CONCLUSIONS:**

The results lead to conclude that foot position influences postural balance during a dynamic movement pattern. A predetermined SBFP may limit the external generalization and the clinical application of the balance test results.