# KINETICS OF STAR BALANCE IN HEALTHY VOLUNTEERS

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## INTRODUCTION

The Star Balance Excursion Test (SEBT) is a dynamic balance tool used by physicians to assess levels of stability and to diagnose injuries. Performance of the SEBT involves standing on one foot and reaching the opposite leg away from the body. Stability and injuries are determined by measuring the distance reached normalized by leg length. Quantification of the SEBT may lead to personalized treatment plans and more accurate diagnostics.

## OBJECTIVE

Is performance of the SEBT on a force plate a qualitative indicator of the learning effects and core stability of healthy individuals?

## METHODOLOGY

20 subjects (10 male, 10 female) participated in the SEBT. Each volunteer performed 5 trials of the test during two separate sessions a week apart. A single trial consisted of seven reaches on each leg. A diagram of the reach directions is shown in Figure 2. The medial direction was not performed for both legs (L4 and R8). Three practice trials were completed and two trials were completed on the force plate.



Figure 1: SEBTperformance [1]



Figure 2: Directions
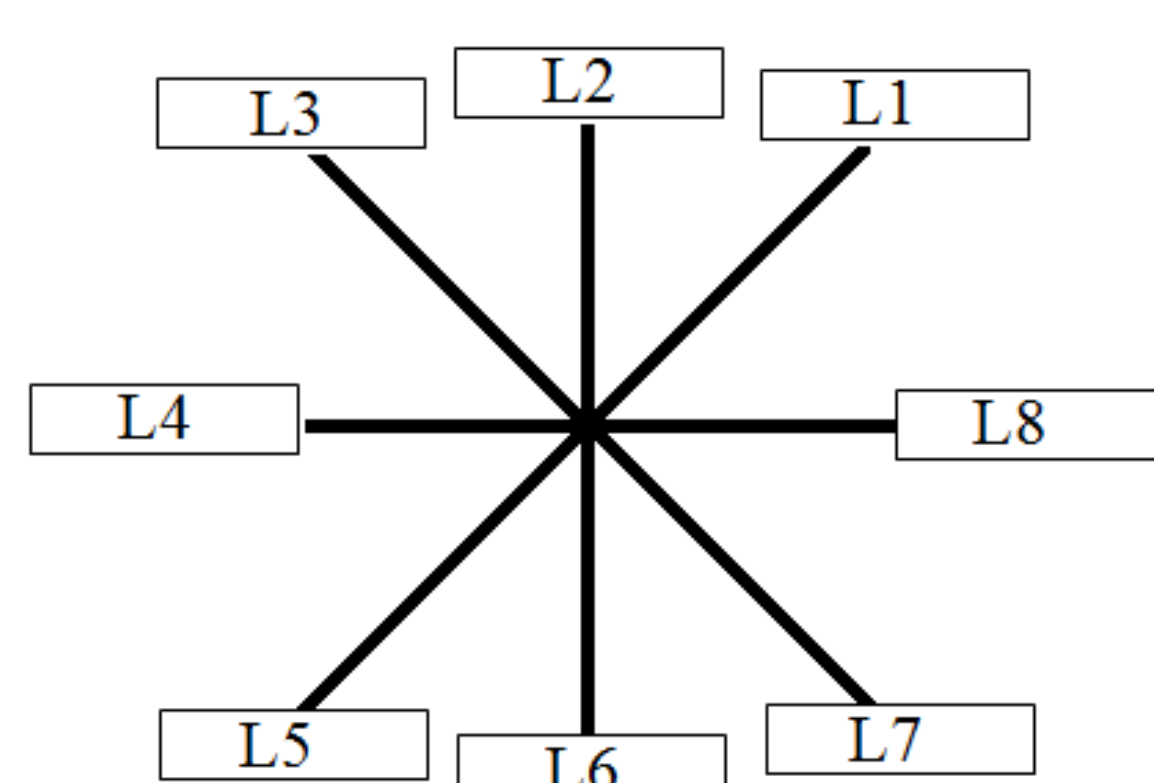
## METHODOLOGY

Reach distances were normalized to each subject's leg length. Data analysis of the force plate SEBT was completed by calculating the center of pressure (COP) frequency using a MATLAB FFT algorithm. Learning affects between trials for the reach distances and force plate COP frequencies were investigated using repeated measures ANOVA.

Figure 3: Center of pressure measurement example using force plate [2]



Center of Pressure Movement Over Time
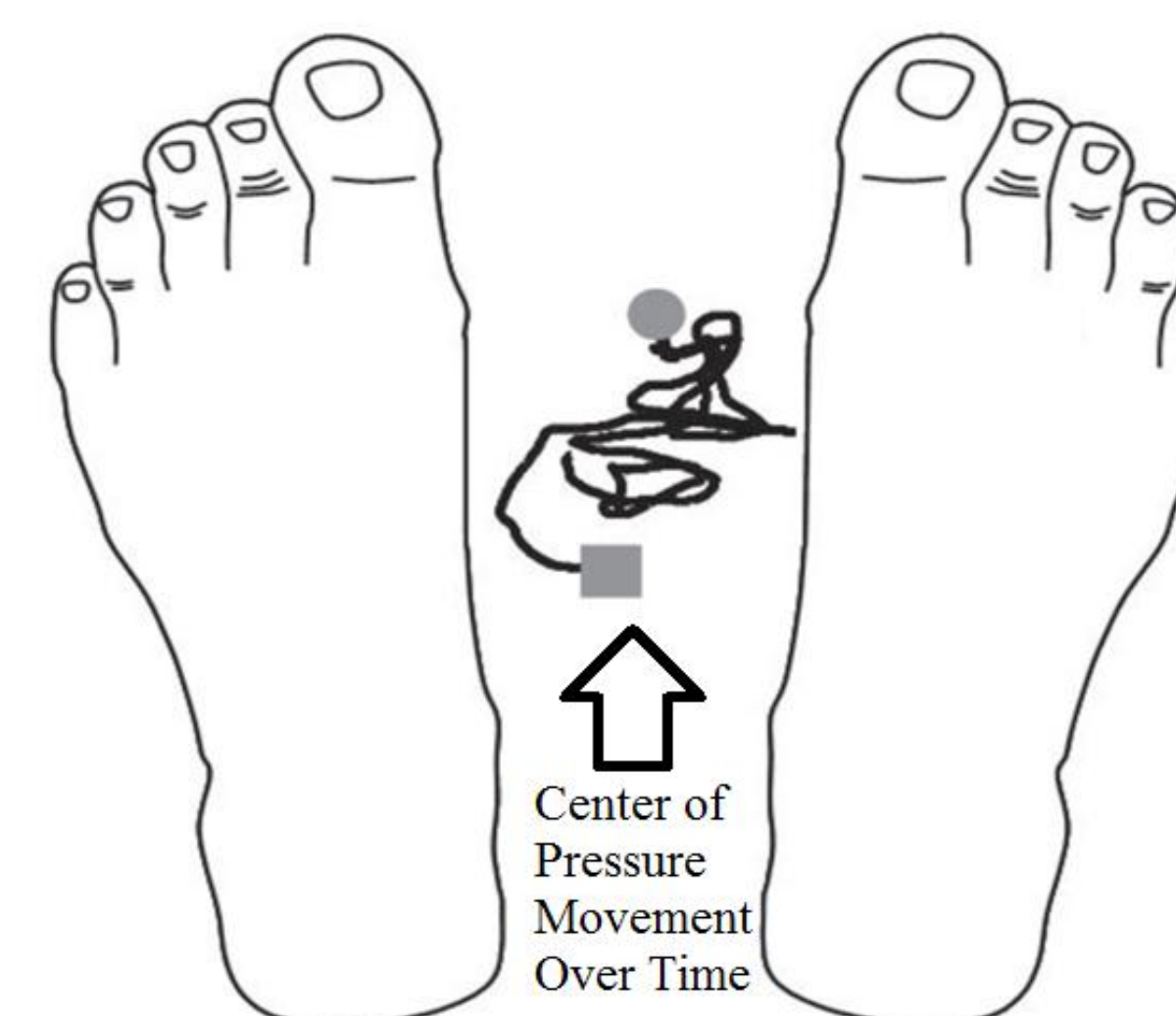
## RESULTS

Significant differences for distances reached on the left leg are displayed in Figure 4.
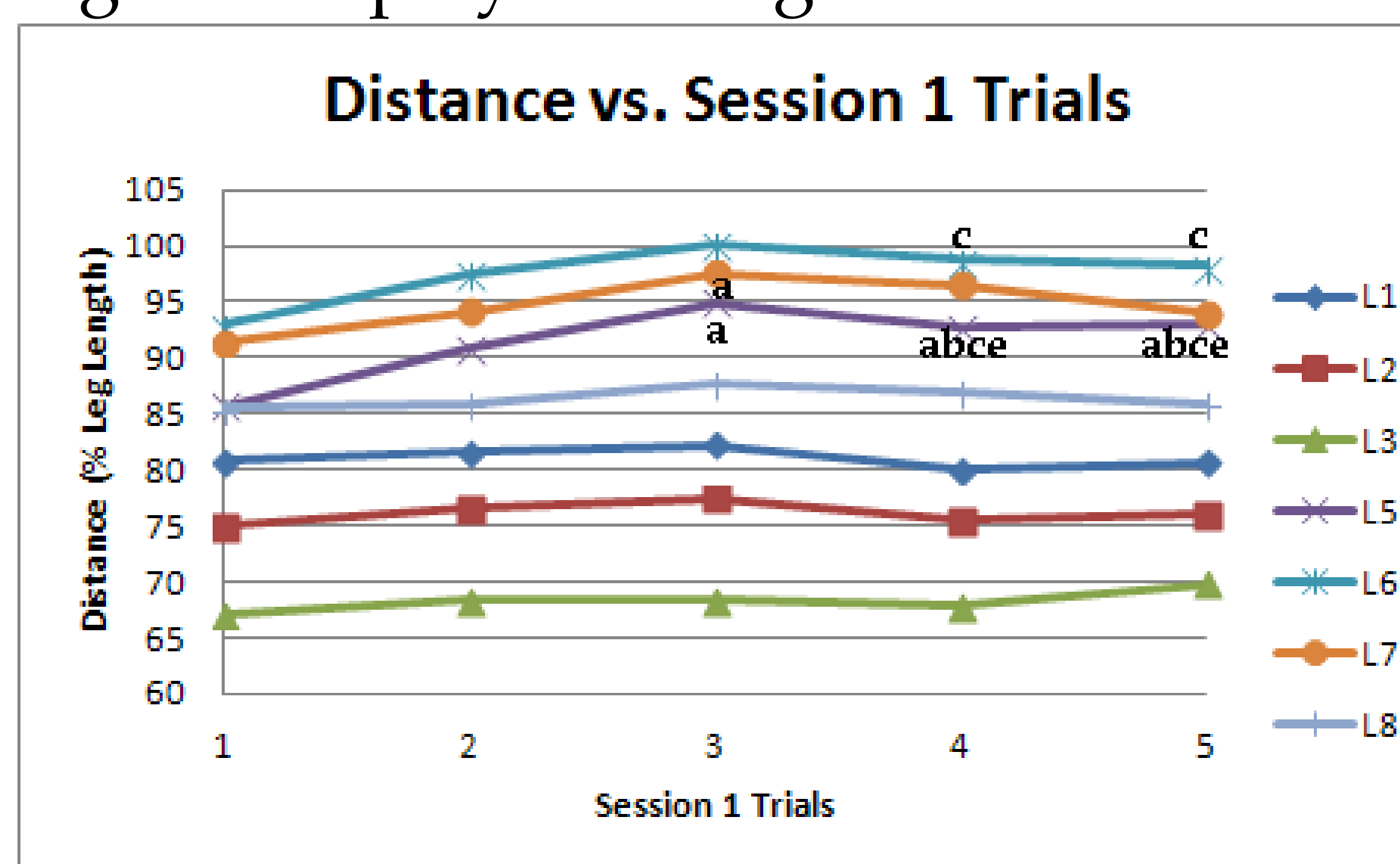


a significant difference from 1st session 1st trial
b significant difference from 2nd session 2nd trial
c significant difference from 2nd session 3th trial
d significant difference from 2nd session 4th trial
e significant difference from 2nd session 5th trial

Figure 4: Reach Distances vs. Session 1 Trials

## RESULTS

A single instance of significance was found between trials for the force plate COP frequency. It occurred between the first session's 4th and 5th trials while reaching with the right leg in direction 3. All values were calculated using a p value of 0.05.

## CONCLUSION

The significance between reach distances for directions L5, L6 and L7 implies a learning affect occurred for the individuals due to practice. These directions likely had a learning affect rather than the others because they are posterior to the body, allowing for easier extension with practice. An insensitivity to learning affects in the force plate likely occurred because of the small range of frequencies of COP sway measured during the SEBT.

## LITERATURE CITED

[1] Munro, A. G. "Between-Session Reliability of the Star Excursion Balance Test." *Physical therapy in sport* 11.4 (2010): 128. Web.

[2] Heise, G. D., Smith, J. D., & Liu, K. Stabilogram Diffusion Analysis Applied to Dynamic Stability: One-Legged Landing From a Short Hop.

## ACKNOWLEDGMENTS