



“THE INFLUENCE OF SOLE RIGIDITY IN SIMULATED BAREFOOT GAIT CENTER OF PRESSURE”

Spooner, A.

California Statue University, Domingues Hills – Master’s of Science in Prosthetics and Orthotics

INTRODUCTION

Currently, the difference between barefoot COP and shoed COP with varying sole stiffness has been examined during running, but not applied to a walking gait (Greenhalgh et. al, 2014). Many minimalist shoes, which often have flexible soles and low to no heel height, make claims that they simulate barefoot experiences (Ellingson, 2016) while providing protection from external physical threat such as sharp objects or weather conditions. Previously, it has been found that a traditional running shoe results in less forefoot function while running, decreasing forefoot influence over balance and stability (Greenhalgh et al, 2014). It was reported time spent reaching foot flat is related to ankle stability, with an ankle that is weight bearing greatly decreasing the likelihood of a sprain related injury. A variety of minimalist shoes are available on the market, ranging in sole stiffness that may affect dynamic COP. For individuals choosing a minimalist shoe, the range of available stiffness in shoe soles may be affecting the degree to which they are simulating a barefoot experience based on how their dynamic COP is changed with the sole stiffness.

The purpose of this study is to examine the relationship between the sole stiffness of minimalist shoe COP measurements. Having a controlled and stable motion in joint kinematics, specifically that which affects the ankle, during able-bodied gait would in theory present without dynamic COP deviations from normal gait. These deviations are expressed in anterior/posterior (A/P) and medial/lateral (M/L) travel of the COP. If the dynamic COP movement with minimalist shoes is similar to that of a “normal” gait seen in barefoot ambulation, then it would be hypothesized for this study that as sole stiffness is decreased, there should be a detectable change in the dynamic COP, examined in A/P and M/L percentage

METHOD

Subjects: five females, ages 23-30

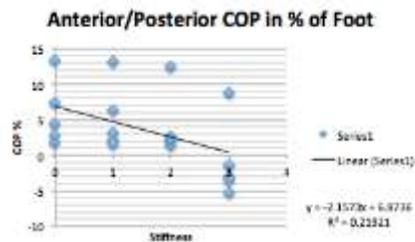
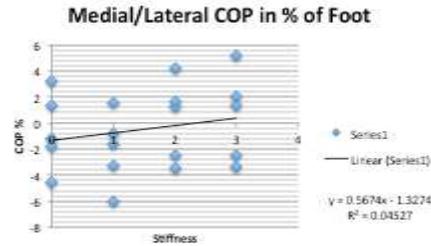
Apparatus: GAITRite, nike crossbionic free size 7.5 1/16”, 2/16”, 3/16” polypropylene footplate

Procedures: data was collected for six passes under four conditions: no plate, 1/16”, 2/16”, & 3/16”, under shoe insoles, respectively.

Data Analysis: COP % of foot in A/P and M/L were examined separately. An r^2 value was assigned to represent the data trend and the p-value was evaluated at $p=.05$ to determine if the data was significant.

RESULTS

The value of R for the anterior/posterior is -.4682, showing a negative correlation but with a weak relationship between variables. The p-value for anterior posterior is not significant at a p-value of $p < .05$. The value of R for the medial/lateral is .2128, showing a positive correlation but with a weak relationship between variables. The p-value for medial/lateral is not significant at a p-value of $p < .05$.



Statistical Data	Anterior/Posterior	Medial/Lateral
R-value	-.4682	.2128
R ² value	.2192	.0543
P-value (p<.05)	.353131	.849591

DISCUSSION

Though a non-linear trend may be present, results are not significant and it is not possible to make a firm conclusion on these relationships with the data collected. A larger sample size would facilitate a better representation of potential patterns.

CONCLUSION

Some correlations exist, but data was not significant.

CLINICAL APPLICATIONS

If a pattern could be determined with future studies demonstrating more natural walking gait kinematics, it may have implications regarding shoe type selection and risk injury.

REFERENCES

- Ellingson, L. (2016) Learn at REI – Expert Advice – Barefoot/Minimalist Running Basics. *Recreational Equipment Incorporated.*
- Greenhalgh, A, et. Al (2014) A comparison of center of pressure variables recorded during running in barefoot, minimalist footwear, and traditional running shoes in the female population. (n.d.). *International Foot & Ankle Foundation for Education and Research*, 7(3).

American Academy of Orthotists & Prosthetists
**43rd Academy Annual Meeting &
 Scientific Symposium**
 March 1-4, 2017