



University of
Salford
MANCHESTER

Association between foot types defined by static and dynamic measures, and the centre of pressure during gait

Liao, S, Javis, HL, Liu, A, Nester, CJ, Bowden, PD, Jones, R and Xiong, Kaiyu

<http://dx.doi.org/10.1186/1757-1146-7-S1-A55>

Title	Association between foot types defined by static and dynamic measures, and the centre of pressure during gait
Authors	Liao, S, Javis, HL, Liu, A, Nester, CJ, Bowden, PD, Jones, R and Xiong, Kaiyu
Publication title	Journal of Foot and Ankle Research
Publisher	BioMed Central
Type	Article
USIR URL	This version is available at: http://usir.salford.ac.uk/id/eprint/32983/
Published Date	2014

USIR is a digital collection of the research output of the University of Salford. Where copyright permits, full text material held in the repository is made freely available online and can be read, downloaded and copied for non-commercial private study or research purposes. Please check the manuscript for any further copyright restrictions.

For more information, including our policy and submission procedure, please contact the Repository Team at: library-research@salford.ac.uk.

MEETING ABSTRACT

Open Access

Association between foot types defined by static and dynamic measures, and the centre of pressure during gait

Su Liao¹, Hannah L Javis², Anmin Liu², Christopher J Nester^{2*}, Peter P Bowden², Richard K Jones², Kaiyu Xiong¹

From 4th Congress of the International Foot and Ankle Biomechanics (i-FAB) Community Busan, Korea. 8-11 April 2014

Background

Foot types (e.g. pronated, supinated foot) are used for clinical reasoning [1] and widely assumed to be related to centre of pressure (COP) patterns [2,3]. Specifically, a pronated foot will demonstrate a medially deviated COP. It follows that COP could be a measure of foot type and inferences about function extrapolated from it. The purpose of this study was to investigate whether COP parameters differ between foot types.

Methods

Static foot posture, foot kinematics and COP data were collected on 90 healthy subjects during walking (Figure 1). The subjects were classified as pronated, supinated, and neutral groups using three static and four dynamic methods (table 1). COP lateral and medial excursion area, COP lateral medial difference (COP_LMD), and COP index (COP_I) were calculated for different phases of stance [4-6]. Independent T test and correlations were calculated among the different groups.

Results

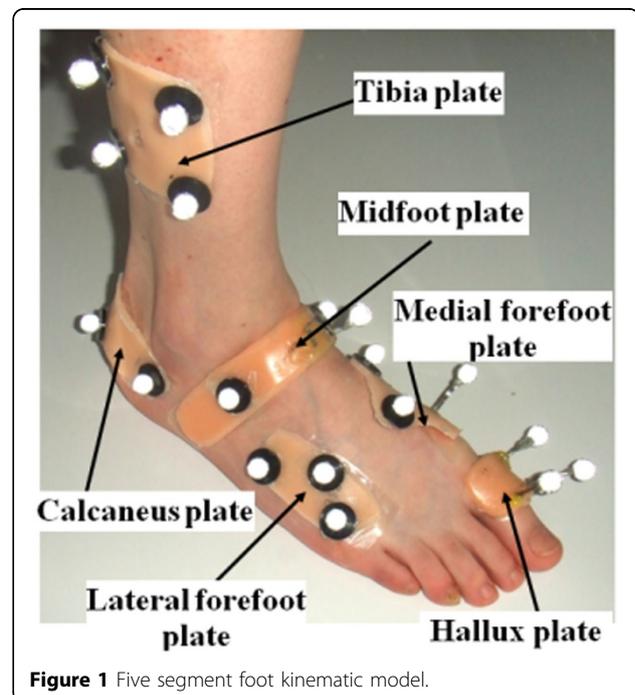
Pronated feet (based on FPI) demonstrated more medial excursion of the COP from heel strike to heel off ($p < 0.05$). Pronated feet classified by NCSP-RCSP demonstrated higher COP_I during HO-TO ($p < 0.05$).

Supinated feet classified by NCSP-RCSP and RRE had more medial excursion of the COP (COP-ME) during HO-TO ($p < 0.05$). Feet classified as supinated by TPRES resulted in a greater COP-LMD in a stance ($p < 0.05$) and their COP_I was statistically significantly higher. Feet classified as supinated by RRE showed higher COP-LMD

value during HO-TO ($p < 0.05$). The statistical results showed a weak relationship between COP parameters of different foot types ($r < 0.27$). Dynamic measures of foot type showed a slightly stronger association to COP measures than static measures of foot type.

Conclusion

Over all, whilst there were some differences between foot types in some COP measures, the meaning of the observed differences does not support the hypothesis that COP parameters are strongly indicative of specific



* Correspondence: cj.nester@salford.ac.uk

²School of Health Sciences, University of Salford, Salford, M6 6PU, UK
Full list of author information is available at the end of the article

Table 1

Classification method	Pronators	Supinators
Foot Posture Index(FPI)	≥ 7	≤ -1
Resting Calcaneal Stance Position (RCSP)	$\leq -2^\circ$	$\geq 3^\circ$
Difference between NCSP* and RCSP	$\geq 8^\circ$	$\leq 4^\circ$
Peak Rearfoot Eversion(PRE)	$\leq -6.1^\circ$	$\geq -1.1^\circ$
Time of Peak Rear foot Eversion (TPRE)	$\geq 38\%$	$\leq 26\%$
Range of Rearfoot Eversion (RRE)	$\geq 16.3^\circ$	$\leq 10.5^\circ$
Maximum Mid Foot Dorsiflexion	$\geq 6.4^\circ$	$\leq 1.1^\circ$

*NCSP:neutral calcaneal stance position

foot types. Thus, COP measures should not be used to infer foot kinematic nor foot function.

Authors' details

¹Sport Science College, Beijing Sport University, Beijing, 100084, China.

²School of Health Sciences, University of Salford, Salford, M6 6PU, UK.

Published: 8 April 2014

References

1. Rao Smita, Riskowski L Jody, Hannan T Marian: **Musculoskeletal conditions of the foot and ankle: Assessments and treatment options.** *Review Article Best Practice & Research Clinical Rheumatology* 2012, **26**(3):345-368.
2. Dixon SJ: **Application of Centre-of-Pressure Data to Indicate Rear foot Inversion-Eversion in Shod Running.** *Journal of the American Podiatric Medical Association* 2006, **96**(4):305-12.
3. Han TR, Paik NJ, Im MS: **Quantification of the path of centre of pressure (COP) using an F-scan in-shoe transducer.** 1999, **10**:248-54.
4. Redmond AC, Crane1 YZ, Menz HB: **Normative values for the Foot Posture Index.** *Journal of Foot and Ankle Research* 2008, **1**(6).
5. Sobel Ellen, et al: **Re-evaluation of the Relaxed Calcaneal Stance Position-Reliability and Normal Values in Children and Adults.** *J Am Podiatric Med. Assoc* 1999, **89**(5):258-64.
6. Landorf K, Keenan AM, Rushworth RL: **Foot Orthosis Prescription Habits of Australian and New Zealand Podiatric Physicians.** *J Am Podiatric Med. Assoc* 2001, **91**(4):174-83.

doi:10.1186/1757-1146-7-S1-A55

Cite this article as: Liao et al.: Association between foot types defined by static and dynamic measures, and the centre of pressure during gait. *Journal of Foot and Ankle Research* 2014 **7**(Suppl 1):A55.

Submit your next manuscript to BioMed Central and take full advantage of:

- Convenient online submission
- Thorough peer review
- No space constraints or color figure charges
- Immediate publication on acceptance
- Inclusion in PubMed, CAS, Scopus and Google Scholar
- Research which is freely available for redistribution

Submit your manuscript at
www.biomedcentral.com/submit

