



POSTER PRESENTATION

Open Access

# Shoes that restrict metatarsophalangeal dorsiflexion cause proximal joint compensations

Dominic Thewlis<sup>1,2\*</sup>, Gunther Paul<sup>3</sup>, Chris Bishop<sup>1</sup>

From 3rd Congress of the International Foot and Ankle Biomechanics Community Sydney, Australia. 11-13 April 2012

## Study aim

To describe barefoot, shod and in-shoe kinematics during stance phase of walking gait in a normal arched adult population.

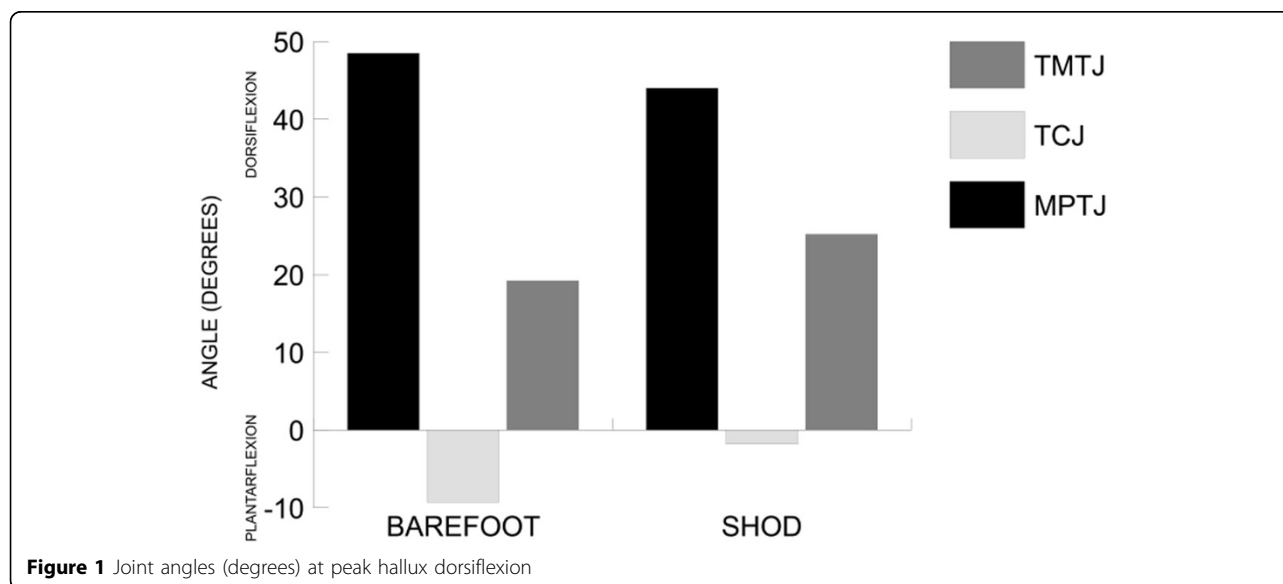
## Materials and methods

An equal sample of males and females ( $n = 24$ ) was recruited. In order to quantify the effect of footwear independent of technical design features, an ASICS shoe (Onitsuka Tiger-Mexico 66, Japan) was used in this study. Markers were applied to three conditions; barefoot, shod, and in-shoe. The calibration markers were used to define static *pose*. The order of testing was randomised. Partici-

pants completed five trials in each condition. Kinematic data were captured using a 12 camera VICON MX40 motion capture system at 100 Hz and processed in Visual3D. A previously developed model was used to describe joint angles [1]. A univariate two-way ANOVA was used to identify any differences between the pairs of conditions. Post-hoc Sheffé tests were used to further interrogate the data for differences.

## Results

At peak hallux dorsiflexion (Figure 1), during propulsion, the metatarsophalangeal joint (MPTJ) was significantly more dorsiflexed in the barefoot condition



**Figure 1** Joint angles (degrees) at peak hallux dorsiflexion

\* Correspondence: dominic.thewlis@unisa.edu.au

<sup>1</sup>School of Health Sciences, University of South Australia, Adelaide, South Australia, 5000, Australia

Full list of author information is available at the end of the article

compared to the shod condition ( $p = 0.004$ ). At the same gait event, the tibiocalcaneal joint (TCJ) was significantly more plantarflexed than both the shod and in-shoe conditions ( $p < 0.001$ ), and the tarsometatarsal joint (TMTJ) was significantly less dorsiflexed in the barefoot condition compared to the shod and in-shoe conditions ( $p < 0.001$ ).

## Conclusions

The findings of the current study demonstrate that footwear has significant effects on sagittal plane MPTJ joint dorsiflexion at peak hallux dorsiflexion, which results in compensations at proximal foot joints.

## Acknowledgements

ASICS Oceania provided the footwear for the study.

## Author details

<sup>1</sup>School of Health Sciences, University of South Australia, Adelaide, South Australia, 5000, Australia. <sup>2</sup>Sansom Institute for Health Research, University of South Australia, Adelaide, South Australia, 5000, Australia. <sup>3</sup>Mawson Institute, University of South Australia, Adelaide, South Australia, 5041, Australia.

Published: 10 April 2012

## Reference

1. Bishop C, *et al*: The development of a multi-segment kinematic model of footwear. *Footwear Science* 2011, **3**:S13-S15.

doi:10.1186/1757-1146-5-S1-P28

**Cite this article as:** Thewlis *et al*: Shoes that restrict metatarsophalangeal dorsiflexion cause proximal joint compensations. *Journal of Foot and Ankle Research* 2012 **5**(Suppl 1):P28.

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](http://www.biomedcentral.com/submit)

