



Aalborg Universitet

AALBORG UNIVERSITY  
DENMARK

**Knee medial contact force response to Customised and Non-Customised foot orthotics:**

*a musculoskeletal study in a Medial Knee Osteoarthritis population*

Mannisi, Marco; Dell'Isola, Andrea; Allan, Richard; Andersen, Michael Skipper; Woodburn, Jim

*Publication date:*  
2018

*Document Version*  
Accepted author manuscript, peer reviewed version

[Link to publication from Aalborg University](#)

*Citation for published version (APA):*

Mannisi, M., Dell'Isola, A., Allan, R., Andersen, M. S., & Woodburn, J. (2018). *Knee medial contact force response to Customised and Non-Customised foot orthotics: a musculoskeletal study in a Medial Knee Osteoarthritis population*. Abstract from 8th World Congress of Biomechanics, Dublin, Ireland.

<https://app.oxfordabstracts.com/stages/123/programme-builder/submission/22210?backHref=/events/123/programme-builder/view/sort/author&view=published>

**General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- ? Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- ? You may not further distribute the material or use it for any profit-making activity or commercial gain
- ? You may freely distribute the URL identifying the publication in the public portal ?

**Take down policy**

If you believe that this document breaches copyright please contact us at [vbn@aub.aau.dk](mailto:vbn@aub.aau.dk) providing details, and we will remove access to the work immediately and investigate your claim.

# **Knee medial contact force response to Customised and Non-Customised foot orthotics: a musculoskeletal study in a Medial Knee Osteoarthritis population**

<sup>1</sup>M. Mannisi, <sup>1</sup>A. Dell'Isola, <sup>1</sup>R. Allan, <sup>2</sup>M. S. Andersen and <sup>1</sup>J. Woodburn

<sup>1</sup>*School of Health and Life Sciences, Glasgow Caledonian University, United Kingdom; email: marco.mannisi@gcu.ac.uk*

<sup>2</sup>*Department of Material and Production, Aalborg University, Denmark*

## **Introduction**

Lateral wedged foot orthoses (LWFO) aim at re-establish a correct biomechanics in patients with medial knee osteoarthritis (MKOA). However, evidence supporting the effectiveness of LWFO is contrasting and may depend on the orthotics design [1]. Therefore, the purpose of this study was to estimate the effect of two different LWFO designs on the medial knee CF in participants with MKOA.

## **Methods**

A 2x2 crossover trial was designed to compare the effect of two orthoses conditions on the knee medial contact force (MCF). The Lateral Wedge Technology Insole (SalfordInsole™, UK) was selected as a non-customized (NC) device while a 3D printing approach was developed to create a modular insole (MOD) customised to participants' foot geometry. Nineteen volunteers with MKOA (age  $54.96 \pm 5.78$  years, BMI  $30.9 \pm 5.1$  Kg·m<sup>-2</sup>) participated in this IRB approved study and provided informed consent.

Each participant attended 4 sessions: (1) First Shod Baseline, (2) First Orthotic, (3) Second Shod Baseline, (4) Second Orthotic. Marker-based three-dimensional kinematic data and ground reaction forces were recorded during each session. Participants were asked to use each of the two LWFO for a period of 12 days prior the test. A 1 week washout period was given between assessment (2) and (3). The LWFO order was randomly assigned.

An anatomically scaled musculoskeletal model was implemented using the Anybody Modeling System v.6.0.5 (AnyBody, Denmark)[2] to estimate the knee MCF.

The impulse of the MCF, corrected per bodyweight, was chosen to estimate the LWFO effect. Non-parametric Wilcoxon Signed Rank Tests were performed to determine the effect of the NC and MOD LWFO with respect to the shod baselines.

## **Results**

The results indicated that the median of the impulse of the MCF for the NC,  $Mdn=0.91$ , was not significantly lower than the median at the corresponding baseline,  $Mdn=0.95$ ,  $Z=141$ ,  $p<0.059$ . The median of the impulse of the MCF for the MOD,  $Mdn=0.96$ , was significantly higher than the median at the corresponding baseline,  $Mdn=0.93$ ,  $Z=149$ ,  $p<0.03$ . No significant difference was found between the two baseline assessments,  $Z=120$ ,  $p<0.314$ . No differences were found in the walking speed for both the NC and MOD with respect to the baselines.

## **Discussion**

Our results showed a limited effect of the two LWFO on the MCF and a high variable response. The MCF increased significantly with the MOD while decreased not significantly with the NC. To improve significantly the effect of LWFO on the MCF, an innovative approach investigating further designs and different materials in the production of LWFO may merit further attention.

## **References**

- [1] F. Xing et al. *Medicine (Baltimore)*, vol. 96, no. 24, p. e7168, 2017.
- [2] M.E. Lund et al. *Int. Biomech.*, vol. 2, no.1, pp. 1-11, 2015.

**Acknowledgments**

EU's KNEEMO Initial Training Network, grant no. 607510.