

Influence of Custom-Moulded Footorthoses (CMFO) with Neuromuscular Operating Elements (NME) on plantar pressure distribution during gait and standing

Münster University of Applied Sciences



Felix Poetzschner, Thomas Stief, Klaus Peikenkamp

Biomechanics Research Laboratory, University of Applied Sciences Muenster, Germany

Custom-Moulded Footorthoses Low Back Pain Plantar Pressure Distribution

Introduction

- The aim of the orthopedic treatment with NME is the improvement of the whole human posture.
- That should result in a reduction of the existing malposition.
- Flexion and extension chain are supposed to be influenced through the NME via gamma reflex arc.
- The importance of receptor cell input for coordinated static and dynamic muscle activation is recognized [1].
- CMFO provides benefits like increased comfort, compliance [2] and better receptor functionality [3].

Leading question

Is it possible to take a specific influence of CMFO and NME on plantar pressure parameters?

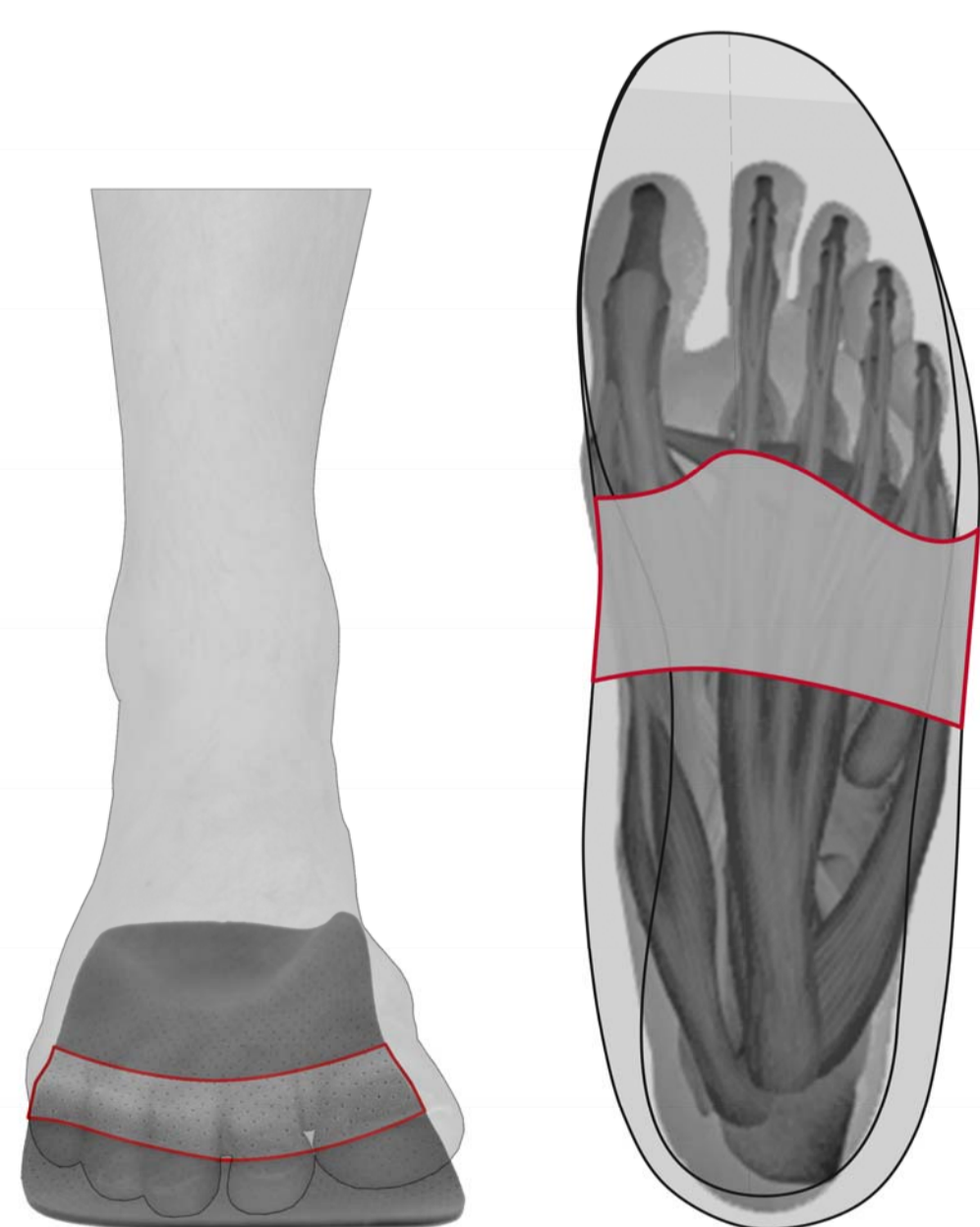


Fig. 1: CMFO with retrocapital NME (red framed)

Methods

- 12 subjects (38±6 years) with hypotonic posture, Low Back Pain, functional malposition
- CMFO (OPCT Tonic01, Sidas) with retrocapital NME (SH55, Sidas) (Fig. 1)

- Insole measurement system (MobilData, GeBioM; 200Hz)
- 2 conditions; during upright standing and treadmill walking: A: without FO (w/o FO), B: with FO

Data analysis

- Parameters: Mean pressure, sum force gradient and the first and second active maximum of the sum force
- Differences between condition A and B presented in % difference to condition A
- Paired t-test; $p < .05$ (*)

Results

- Only results for retrocapital NME are presented
- No influences on sum force parameters during upright standing
- Sum force gradient at foot strike decreases significantly by 14% during gait (Fig. 2)

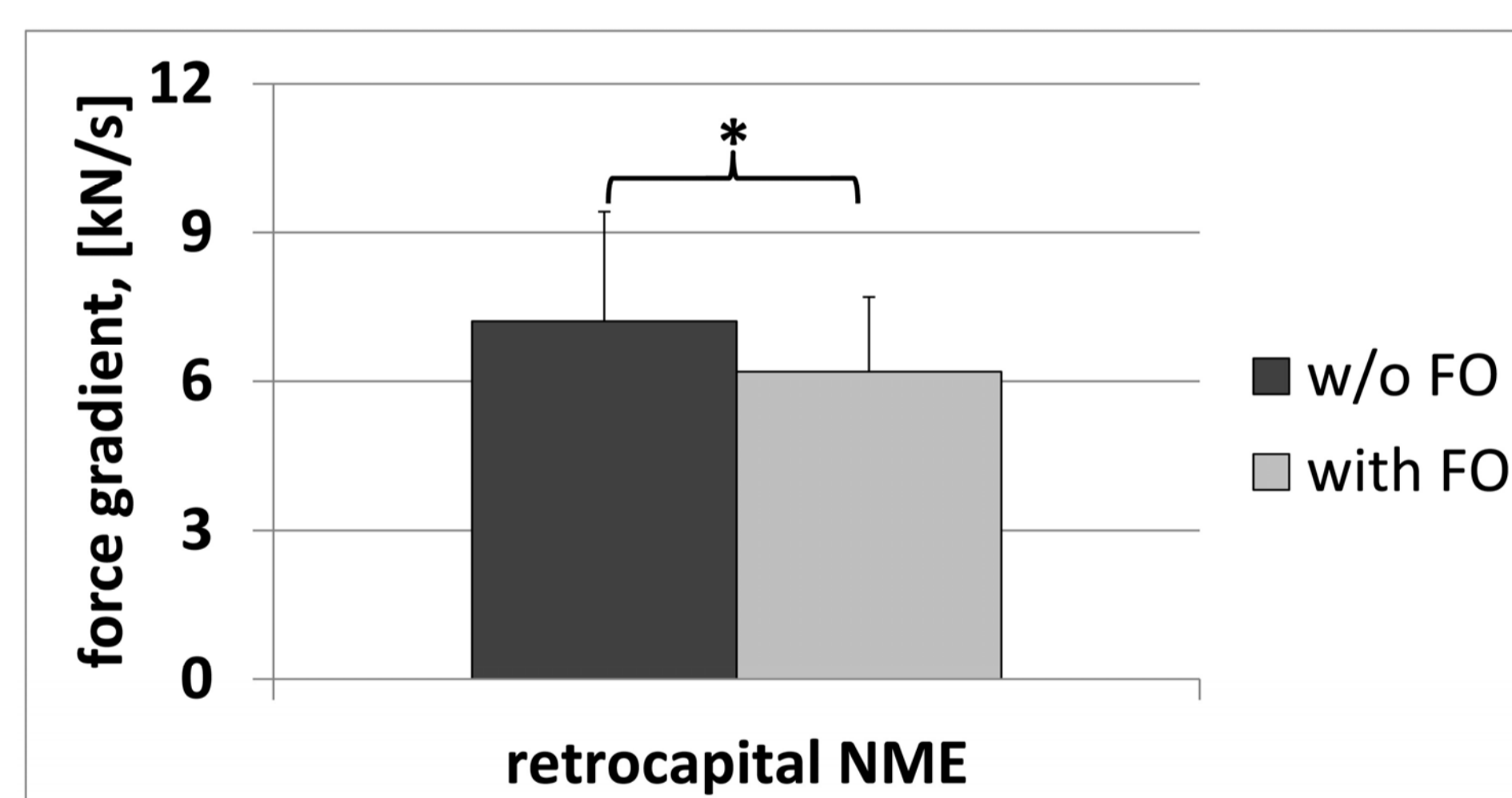


Fig. 2: Sum force gradient at foot strike

- First active maximum of sum force decreases significantly by 12% (Fig. 3)

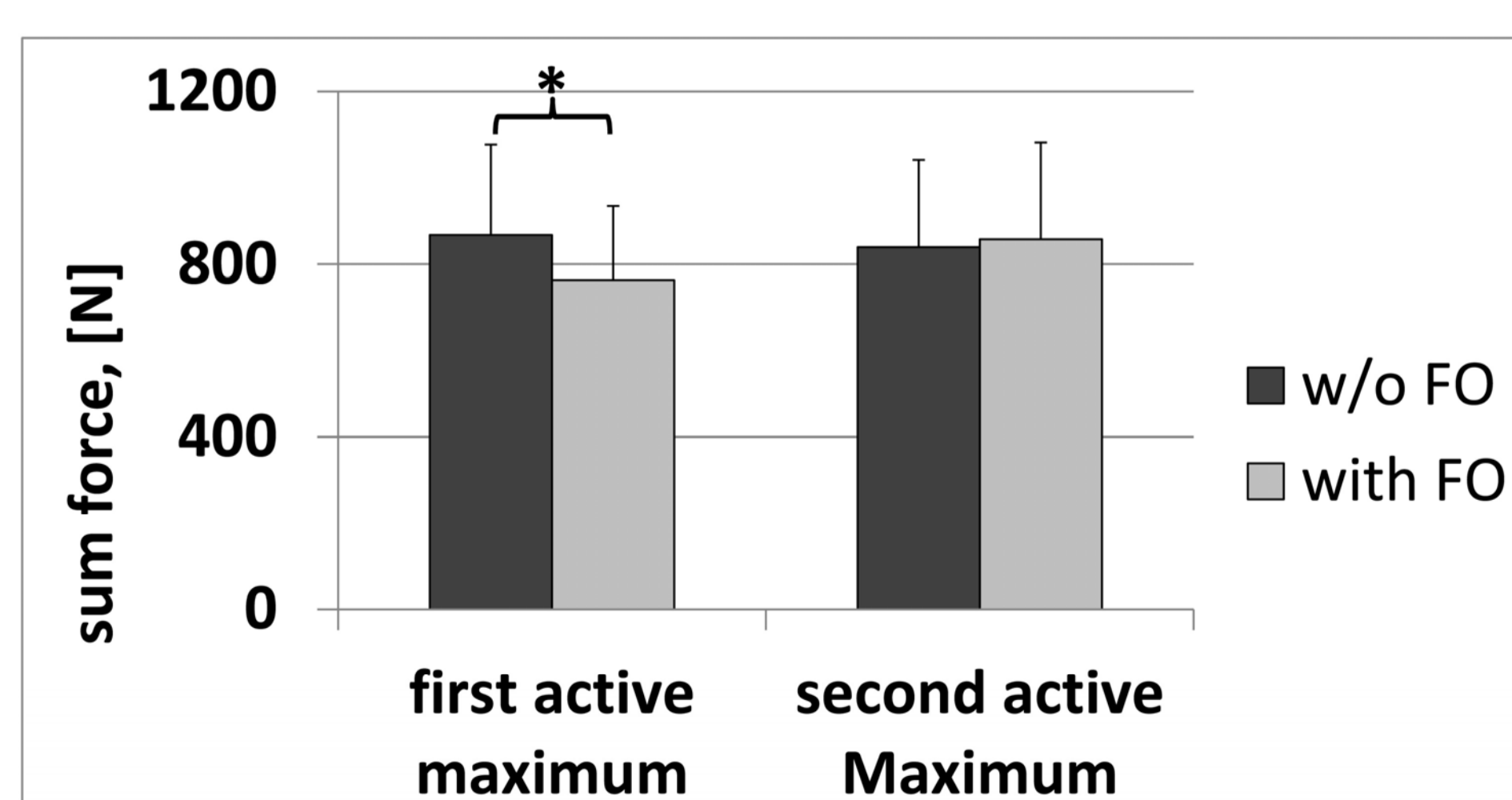
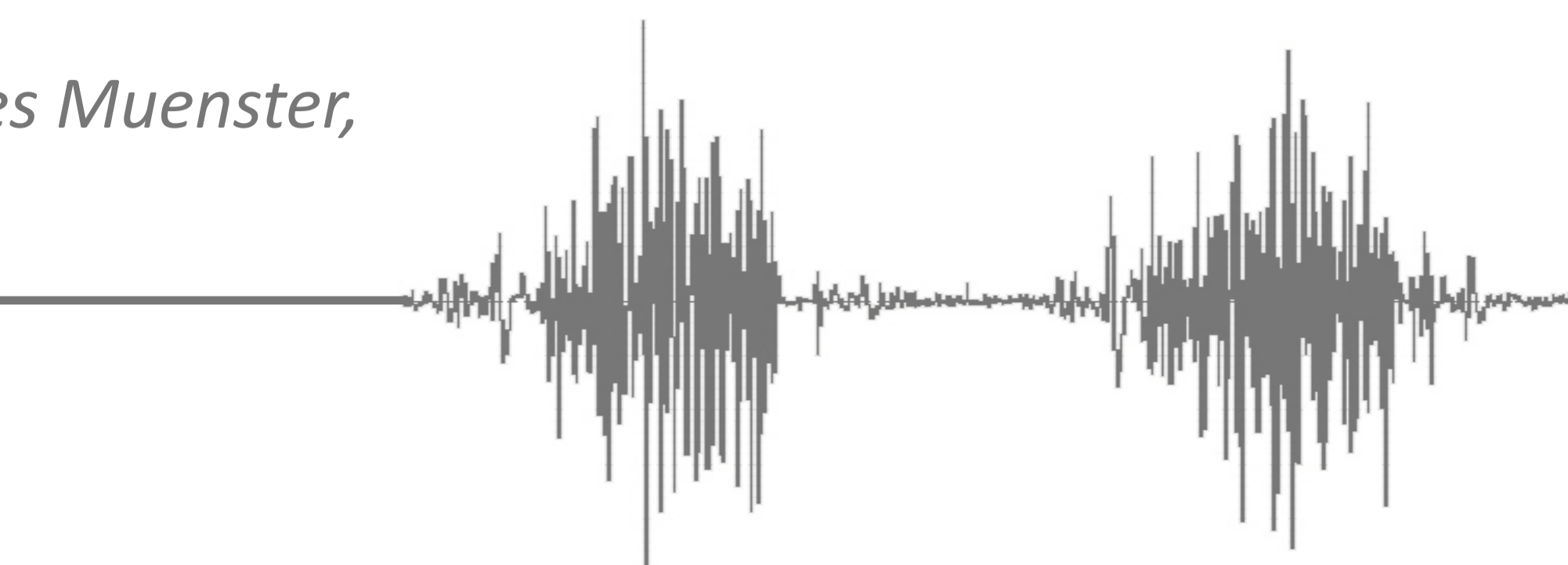


Fig. 3: First & second active maximum of sum force



- Second maximum not affected
- Mean pressure decreases significantly (entire foot -6%; medial foot -14%) (Fig. 4)

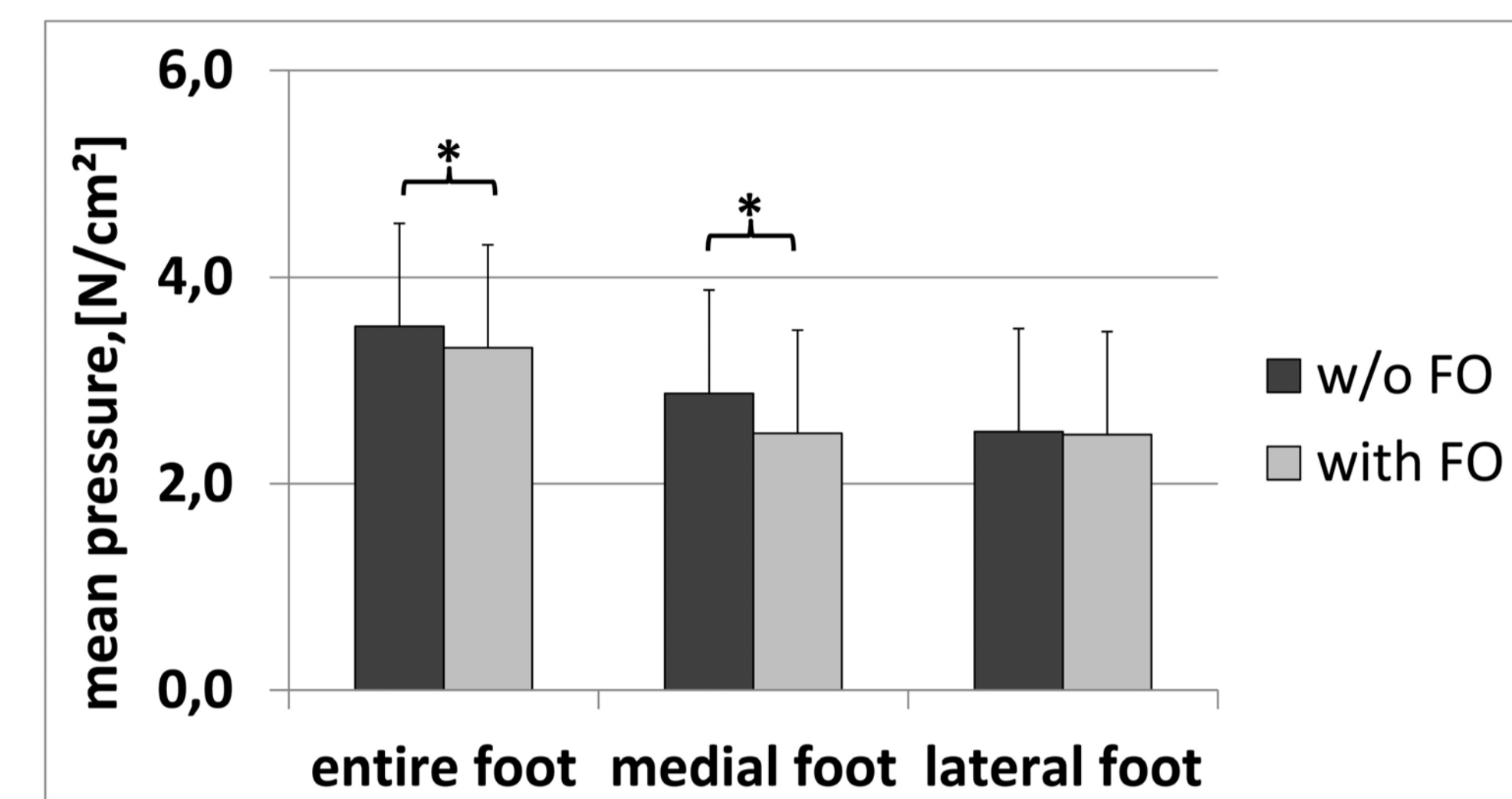


Fig. 4: Mean pressure

- No significant effect at lateral foot

Discussion

- The essential effects of the NME are found on first part of the stance phase.
- The decrease of sum force gradient supposes an improved damping at foot strike.
- However previous studies detected similar effect by using CMFO without surface modulated footorthoses [4].
- Despite of the specific decrease of the first sum force maximum, the postulated boost at the end of stance phase can not be detected.
- The mean pressure results suppose a more centralized pressure load and indicate a possible change in muscle status.
- Further studies analyze the short- and long-term effects on muscle activation, subjective parameters.

References

- Dietz V, Duysens J. Significance of load receptor input during locomotion: a review. *Gait & Posture*, pages 102-110; 11,2000.
- Mündermann A, Nigg BM, Humble RN, Stefanyshyn DJ. Orthotic comfort is related to kinematics, kinetics and emg in recreational runners. *Medicine and Science in Sports and Exercise*, pages 1710-1719; 35(10), 2003.
- Cobb SC, This LL, Johnson JT. The effect of 6 weeks of custom-moulded foot orthosis intervention on postural stability in participants with ≥ 7 degrees of forefoot varus. *Clinical Journal of sports medicine*, pages 316-322; 16(4), 2006.
- Mündermann A, Nigg BM, Humble RN, Stefanyshyn DJ. Foot orthotics affect lower kinematics and kinetics during running. *Clinical Biomechanics*, pages 254-262, 18(3), 2003.