

# **Influence of CUSTOM-MOULDED Footorthoses (NFO) with neuromuscular operating elements on muscle activity during treadmill walking – a randomized controlled study**

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## **1. Summary**

NFO are controversially discussed and still not evaluated. In contrast to recent studies we are interested in muscular activation. Based on the detected effects, a better understanding and an individual treatment of NFO should be resulting in increasing benefit for patients.

## **2. Introduction**

Bourdiol developed in the 70s an insole concept by which the human posture should be changed positively by influencing the plantar foot sensibility with special elements on flat insoles. These NFO are used to treat posture ailment of the whole human locomotor system, whereas mechanically operating Footorthoses (MFO) focus on orthopedic foot problems. Several scientific studies validated the effects of CUSTOM MOULDED Footorthoses (CFO), a special kind of MFO. But there is no proof of long-term effects and the sustainability of the MFO. NFO are still controversially discussed due to the missing scientific background. Research topics of a majority of studies were the influences of the insoles during upright standing. This analysis is going to test orthopedic insoles, which combine mechanically and neuromuscular operating factors (NCFO). The following question has to be answered: Is there an influence of the NCFO on the activation of the muscle chains?

## **3. Material and methods**

In this longitudinal randomized controlled study 50 individuals (6 till now, age  $35 \pm 2,4$  yr) with hypotonic posture and pain in the lumbar region will participate in this study. The used NCFO (OPCT Tonic 01, SIDAS; *figure 1*) were built by one of the authors. Myoelectric signals of 24 muscles at the lower limb and trunk were recorded with EMG (Biovision, 2000 Hz). All cycles were performed on a treadmill (Callis Ortho, Sprintex) by using subjects own shoes with two conditions (NMFO and control). Subjects walk at their favored speed (range 3,5-5,0 km/h). IEMG during stance phase of 50 steps was analyzed for each condition. The following muscle chains were considered: flexion chain (GAM), extension chain (GPM), internal rotation chain (KAM) and the external rotation chain (GPM) were focused. The IEMG of the control conditions were normalized to 100 % and the IEMG of NCFO were related to the control condition.

## 4. Results

The IEMG of the GAM (figure 1: GAM\_inhib.), which should be inhibited, decreases from 100 %  $\pm$  11 % to 92 %  $\pm$  7 %. Simultaneous the activation of the GPM (GPM\_activ.), which should be activated, increases from 100 %  $\pm$  14 % to 124 %  $\pm$  9 %. The IEMG of the KAM\_inhib. is reduced from 100 %  $\pm$  11 % to 97 %  $\pm$  14 %. The IEMG of the KPM\_activ. raises from 100 %  $\pm$  9 % to 112 %  $\pm$  12 %. The activity of the GAM\_activ. does not increase it decreases from 100 %  $\pm$  13 % to 97 %  $\pm$  11 % and the IEMG of the GPM\_inhib. decreases from 100 %  $\pm$  17 % to 96 %  $\pm$  8 %.

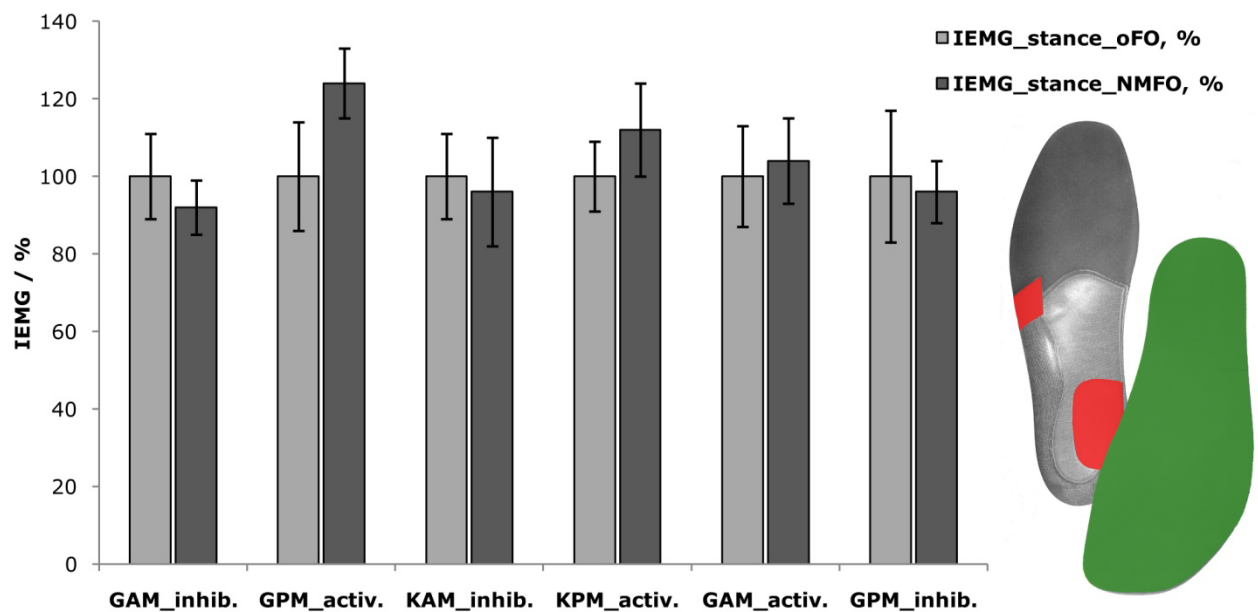


figure 1: IEMG for the analyzed muscle chains and controlled NMFO

## 5. Conclusion

The aim of this study was to evaluate the influences of the NCFO on the activation of the analyzed muscle chains. IEMG of the GAM\_inhib. could be reduced (figure 1), as it is suggested in the NFO concepts. But there are some individual variations, the deviation was between 7 % and 11 %. Influences on the GAM\_activ., GPM\_inhib., KAM\_inhib. and KPM\_activ. were quite low compared to the relatively high deviations. The increase at the GPM\_activ. can be interpreted as an activation. Neuromuscular operating elements behind the metatarsal heads had the postulated influence on the activity of the muscle chains. So we can deduce that there is a different activation of the muscle chains caused on the NCFO. Until the congress in Leipzig there will be further interesting parameters, more representative results and evidence to these insoles, caused by a bigger investigational group and conclusions for practical use of the NCFO should be possible.

## 6. References

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