

**Title:**

Congress Theme: "From rehab to prehab"

Title: "THE EFFECTS OF INSOLES ON OVERUSE INJURIES OF THE MILITARY PERSONNEL.

Observational study"

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**Summary****"ABSTRACT**

**Background:** Overuse injuries of the lower extremities are common in military population. Medical costs, lost training time and attrition generated by these pathologies are burden for Defense. Foot orthoses are frequently used by clinicians in the management of overuse injuries of the lower limb. The in-shoe devices are often recommended to sustain or correct abnormal foot position during the stance phase of gait so that it improve kinematic control or to reduce the magnitude of force during impact or finally to optimize neuromotor control.

**Hypothesis:** The use of Dynamic Orthotic Devices, custom-made insoles based on 3D foot scan or data from individual dynamic gait measurements in order to customize the insoles to the individual's feet, can be effective in the management of two specific overuse injury of the lower extremity: Patello Femoral Pain Syndrome (PFPS) and Medial Tibial Stress Syndrome (MTSS).

**Objective:** The objective of the current study was to research the effect of for kinds of insoles (Dynamic Orthotic Devices) on muscle activity and Pain Disability Index (PDI), as a standalone treatment, in military personnel suffering from PFPS or MTSS.

**Study Design:** Cross-over study

**Method:** The research was conducted by the Center for Physical Medicine & Rehabilitation in the Military Hospital Queen Astrid, in Brussels. The study included 38 patients with PFPS, 43 patients with MTSS and 42 healthy control participant. Both patient groups were subjected to two successive eight-week period of insole intervention, of which outcome was demonstrated by surface electromyography (sEMG) data and PDI scores. The insole therapy consisted of four insole types: Phits® RS Print Custom 3D printed insoles; BorgInsole® Custom; GesPodo® Custom and Decathlon Aptonia Memory Foam®. Patients were each randomly assigned to two insole (of the 4) interventions. sEMG measurements were performed in all participants while walking/running on a treadmill at four velocities: 4 km/h, 10 km/h, 12 km/h and self-selected speed. The muscle activity of M. Tibialis Anterior (TA), M. Peroneus Longus (PL), M. Biceps femoris (BF), M. Gastrocnemius Lateralis (GL) and Medialis (GM) and M. Vastus Medialis (VM) and Lateralis (VL) was measured three times: at baseline, at the start of each intervention period and at the end of each intervention period (after 8 weeks). Maximal Voluntary Contraction (MVC) of every individual muscle was also registered at baseline for every group. sEMG data of the MVC together with the sEMG data recorded during treadmill walking/running were used to calculate a relative value in order to be able to compare results of the subjects. The PDI scores were obtained at the start and at the end of both intervention periods.

**Results:** Baseline muscle activity without insoles was compared between the patient and the matched control group. The MTSS group showed a trend of significant lower activity in some

muscles while the PFPS group showed an increased activity of the VM and TA at different moment of the running cycle.

The second analysis examined the effect of each insole on the three different moments. Results were heterogeneous across all tested insoles and muscles. For the MTSS group the following muscles were the most affected by the intervention: TA, PL, GL and GM. For the PFPS group a tendency of muscle activity decrease was observed when first using the insole but it increases again after 8 weeks of habituation.

Third analysis consisted of PDI score comparison. The MTSS group showed no significant difference between the PDI score at the end vs at the beginning of the intervention for both intervention period. For the PFPS group a significant decrease in pain was observed when just receiving the second insole compared to the start of using the first insole. However, evaluation of the PDI score demonstrated no significant results after the 8-week period of wearing the first insole compared to wearing the second pair.

**Conclusion:** Regardless of the available significant data for both intervention group, it was not possible to draw a generalised conclusion about the influence each insole could have on muscle recruitment in MTSS and PFPS patients. Researchers of this study have the opinion that a longer follow-up period is needed, as it is still unclear if insoles can influence the symptoms surrounding MTSS and PFPS that have already been developed.

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