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## Evaluation of Protalus Insoles: M100 and T100 Models

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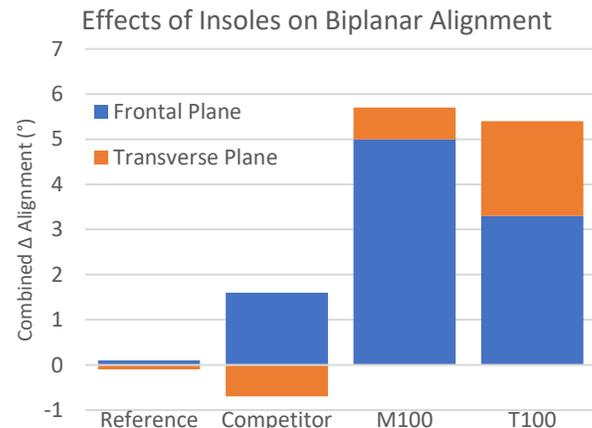
Disclosure: BioMechanica, LLC is a privately owned, independent company that provides biomechanics research, testing and other technical services to the sporting goods, military and medical industries.

**Introduction:** Insoles are commonly employed in shoes to enhance comfort, support the arch of the foot or to correct alignment problems. Decades of research has shown that excessive pronation of the foot is a significant factor in overuse injuries including Achilles tendinitis, plantar fasciitis, patellofemoral pain syndrome (anterior knee pain), and other common injuries<sup>1-3</sup>. Protalus makes specific claims about the effects of their insoles of “improved alignment of the body”, “improved cushioning” and “reduced peak pressure” compared to other insoles which are evaluated in this study.

**Methods:** Thirty-nine participants (30 male, 9 female) were recruited for this study. Protalus insoles (M100 and T100) were compared against a generic stock EVA insole, and a leading competitors best-selling insole. The four insoles went through a battery of mechanical and human subject tests, comparing their effects on:

- 1) *Alignment: measured using 3D motion capture analysis*
  - 2) *Shock absorption: compared with ASTM F1976 standard testing methods*
  - 3) *Comfort: In-shoe peak pressure maps and self-reported questionnaire*
- Statistical tests of significance were performed to identify differences in the insoles (alpha = 0.05).*

**Results: Alignment:** Compared with the reference EVA insole, the M100 reduced overpronation between the tibia and the heel by an average of 62% (8.0° to 3.0°) and between the tibia and the arch by an average of 17% (from 4.5° to 3.7°). The T100 insoles reduced the deviation from neutral alignment at the heel by 41% (8.0° to 4.7°) and by 47% at the arch (4.5° to 2.4°). **Shock absorption:** The Protalus insoles demonstrated superior impact attenuation in both the heel (20%) and forefoot (15%) compared with both the EVA and competitor insoles. **Comfort:** Overall, subjects gave statistically higher ratings to the Protalus insoles than to the EVA control for “comfort”, “stability” and “support”. In the heel, the competitor and both Protalus insoles reduced peak pressure compared with the EVA control, by an average of 8%, which is typically associated with improved comfort.



**Conclusion:** The results of alignment testing, mechanical tests of shock absorption, and peak pressure maps confirm Protalus’ claims of “improved alignment of the body”, “improved cushioning” and “reduced peak pressure”. These objective test methods coincide with participant preference testing. Both Protalus insoles were rated higher in “comfort” than both the stock EVA insole and the competitor insole.

<sup>1</sup> Hintermann, Beat, and Benno M. Nigg. "Pronation in runners." *Sports medicine* 26.3 (1998): 169-176.

<sup>2</sup> Irving, Damien B., et al. "Obesity and pronated foot type may increase the risk of chronic plantar heel pain: a matched case-control study." *BMC musculoskeletal disorders* 8.1 (2007): 41.

<sup>3</sup> Clement, D. B., J. E. Taunton, and G. W. Smart. "Achilles tendinitis and peritendinitis: etiology and treatment." *The American Journal of Sports Medicine* 12.3 (1984): 179-184