

Effects of thin plantar inserts on the horizontal heterophoria: modification of the functional relationships between the foot and posture

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Aim: The muscles of the feet seem to work with a functional synergy with the ocular muscle: the invertors muscles of the feet are synergic with the convergence muscles and the evertors of the feet work together with the divergence muscles (Roll et al. 1988). Vertical heterophoria could reflect a mild global sensorimotor conflict between sensory, such as somesthetic, and motor inputs affecting the performance of balance control and maybe lead to pain (Matheron et al. 2011). Medial arch support is more effective than lateral arch support and acts upon divergence, whereas lateral arch support produces its effects upon convergence only. (Foisy et al. 2015)

The aim of this study was to verify the modifications of horizontal heterophoria with maintaining an External Heel Wedge (EHW) applied according to the Bricot's method.

Methods: seventeen healthy subjects with the right dominating eye were recruited (age 31±5 years). The EHW was made from a cork half moon thickness of 1.5 mm, length 6 cm and a height of 3 cm. The Maddox rod test to evaluate the horizontal heterophoria was performed. For both eyes we evaluated the distance of correction and calculated the difference between eyes.

The sequence of tests foresaw: trials baseline without EHW, trials with EHW, trials after an adaptation period of 15 minutes on treadmills with EHW.

Results: Data showed statistically significant variations (Parametrical statistic analysis ANOVA, Post-hoc, Baseline vs After 15 min, $p < 0.05$) in the Discrepancy of exophoria between two eyes and Left eye correction.

Conclusions: This study has shown how a mechanical stimulation applied on the plantar arch can affect the optical axis. The results highlight that the application of this kind of stimulation decreases significantly the discrepancy of correction of the exophorias between two eyes. This variation occurred on the non-dominating eye while the dominating eye didn't suffer significant changes.

Reference

Roll JP, Roll R. (1988) From eye to foot: a proprioceptive chain involved in postural control. In: Amblard B, Berthoz A, Clarac F, editors. Posture and gait: Development, adaptation and modulation. Elsevier, Amsterdam, pp. 155–164.

Matheron E, Kapoula Z (2011) Vertical heterophoria and postural control in nonspecific chronic low back pain. PLoS One. 2011 Mar 30;6(3).

Foisy A, Gaertner C, Matheron E, Kapoula Z (2015) Controlling posture and vergence eye movements in quiet stance: effects of thin plantar inserts, PLoS One. 2015 Dec 4;10(12).