

# Bilateral and unilateral increases in calcaneal eversion affect pelvic alignment in standing position

Rafael Z.A. Pinto <sup>a</sup>, <sup>a</sup>, Thales R. Souza<sup>a</sup>, Renato G. Trede<sup>a</sup>, Renata N. Kirkwood<sup>a</sup>, Elyonara M. Figueiredo<sup>a</sup> and Sérgio T. Fonseca<sup>a</sup>

<sup>a</sup>Movement Analysis Laboratory, Department of Physical Therapy, Universidade Federal de Minas Gerais (UFMG), Av. Antônio Carlos 6627, Escola de Educação Física, Fisioterapia e Terapia Ocupacional, CEP: 31270-010, Belo Horizonte, MG, Brazil

Received 25 November 2006; revised 29 May 2007; accepted 3 June 2007. Available online 1 October 2007.

## Manual Therapy

Volume 13, Issue 6, December 2008, Pages 513-519

## Abstract

Excessive foot pronation has been associated with the occurrence of low back pain, possibly for generating changes in the lumbopelvic alignment. However, the influence of foot pronation (measured as calcaneal eversion) on pelvic alignment during standing has not been well established.

Fourteen young healthy subjects participated in the study. A Motion Analysis System was used to obtain pelvic positions in sagittal and frontal planes and calcaneal position in the frontal plane. Volunteers were filmed in relaxed standing position during three trials, in three conditions: control; unilateral experimental with increased right calcaneal eversion and bilateral experimental with increased bilateral calcaneal eversion. Increased calcaneal eversion was obtained using wedges tilted 10° medially, unilaterally and bilaterally. Repeated measures ANOVAs with Bonferroni corrections were used for statistical analysis.

Unilateral and bilateral use of medially tilted wedges produced a significant increase of calcaneal eversion ( $P \leq 0.01$ ), on the right and left sides. Bilateral and unilateral increases of the calcaneal eversion caused average pelvic anteversion of 1.57° ( $P=0.003$ ) and 1.41° ( $P=0.021$ ), respectively. Unilaterally increased everted position generated an average pelvic lateral tilt of 1.46° ( $P<0.001$ ).

Excessive calcaneal eversion during standing changes pelvic alignment and should be considered, associated with other relevant factors, when assessing pelvic misalignments.

**Keywords:** Posture; Pelvis; Calcaneus; Foot pronation.