Efficacies of different external controls for excessive foot pronation: a meta-analysis
Cheung RT, Chung RC, Ng GY

CRD summary
This review found foot orthoses (supports), motion control footwear and therapeutic adhesive taping were effective in controlling foot pronation (rotation) compared with no intervention. The authors’ conclusions should be treated with caution because of minimal differences between the interventions and control treatments and the reliance on small-sized trials.

Authors’ objectives
To investigate the efficacy of different anti-pronation interventions in reducing calcaneal eversion (foot rotation) during gait.

Searching
PubMed, EMBASE, CINAHL and AMED were searched up to November 2010 for relevant studies published in English; search terms were reported. Reference lists from retrieved articles were checked to identify additional studies.

Study selection
Eligible for inclusion were clinical or quasi-randomised controlled trials that compared foot orthoses motion control footwear or therapeutic adhesive taping versus no intervention. Eligible participants were healthy adults diagnosed with musculoskeletal conditions likely to be related to excessive foot pronation. Trials of patients with any neurological condition, and trials that did not evaluate the interventions during weight-bearing activities were excluded from the review. The outcome of interest was calcaneal eversion measured during standing, walking and running.

Included participants were healthy adults with a range of physical activity levels. Their age ranged from 14 to 53 years (where reported). Males and females were included; some trials included runners. Where stated, some participants had plantar fascitis, lower quarter dysfunction, patellofemoral pain syndrome, and other running injuries. Some participants did not present with over-pronation; others had prescribed orthoses. The no-intervention control group were barefoot or wore shoes. The testing conditions for the participants were walking or running on treadmills or over ground.

Two independent reviewers performed the study selection.

Assessment of study quality
Methodological quality of included trials was assessed by two independent reviewers using the PEDro scale. Items assessed were subject allocation and randomisation, treatment randomisation, blinding, the use of intention-to-treat analyses, and reporting of results. Any trial achieving over 8 points was regarded as high quality. Any disagreements between reviewers were resolved by a third reviewer.

Data extraction
Data were extracted to present mean differences and standard deviations between the experimental and control groups. The reviewers contacted trial authors to locate missing information.

The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
Pooled weighted mean differences (WMD) and 95% confidence intervals (CIs) from trials that scored 5 or more for quality were calculated using a random-effects model.

Heterogeneity was assessed using $I^2$, where $I^2$ scores of over 50% indicated moderate to high heterogeneity.

The potential for publication bias was evaluated with funnel plots and the Egger's regression analysis.

Results of the review
Twenty-nine trials (486 participants) were included in the review. Sample sizes ranged from five to 40 patients. Thirteen trials investigated foot orthoses, 10 trials examined motion control footwear, and 10 trials evaluated therapeutic adhesive taping; some trials evaluated more than one intervention.

Four trials were scored 7 points on the PEDro quality scale, five trials scored of 6 points and 20 trials scored 5 points. In most trials, subject allocation and treatment sequence were not randomised. The average quality scores were 5.38 for the trials of foot orthoses, 5.56 for the trials of motion control footwear and 5.43 for the trials of therapeutic adhesive taping.

There were significant reductions in calcaneal eversion observed with therapeutic adhesive taping (WMD 2.64 degrees, 95% CI 1.39 to 3.90; ι²=92%; 10 trials), motion control footwear (WMD 2.52 degrees, 95% CI 1.71 to 3.33; ι²=92%; 10 trials) and foot orthoses (WMD 2.24 degrees, 95% CI 1.42 to 3.07; ι²=65%; 13 trials) compared with no-intervention control groups.

Comparisons within the foot orthoses category showed that custom-made orthoses produced greater calcaneal eversion reduction (WMD 2.35 degrees, 95% CI 1.24 to 3.45) than prefabricated orthoses (WMD 2.08 degrees, 95% CI 0.66 to 3.51).

The use of motion control footwear with dual materials in the mid-sole produced significant reductions in calcaneal eversion (WMD 2.77 degrees, 95% CI 1.74 to 3.81), although motion control footwear with heel flare or wedge modification did not produce significant differences.

High-dye and stirrup taping techniques were found to be effective in controlling calcaneal eversion (WMD 4.62 degrees, 95% CI 3.73 to 5.50), but there were non-significant changes in foot pronation with low-dye taping.

The results of the Egger's regression test did not show any evidence of publication bias for the foot orthoses analysis, but there was marginal publication bias present for the analyses of motion control footwear and therapeutic adhesive taping.

**Authors’ conclusions**

Foot orthoses, motion control footwear and therapeutic adhesive taping were effective in controlling foot pronation compared with no intervention. However, the differences between treatments were small.

**CRD commentary**

The review addressed a clear question. Criteria for the inclusion of studies in the review were stipulated and reproducible. Appropriate databases were searched for relevant studies, although the restriction of the review to published studies in English means that there was a risk of language and publication biases; some studies may have been missed. Appropriate methods were used to evaluate publication bias. Steps were taken to minimise errors and bias in the review process for study selection and the assessment of methodological quality, but were not stated for data extraction.

The quality of the included trials was average, although the coding of the quality assessment was not clearly outlined. There was statistically significant heterogeneity observed across the trials for all the results, which meant it was unclear whether the results of the trials should have been pooled statistically. There were only small numbers of trials identified within each anti-pronation category and the numbers of participants included in the trials were very small. The authors’ conclusions about the differential effectiveness of each anti-pronation type (based on indirect comparisons) should be treated with caution. In addition, the differences found between the interventions compared with control treatment were small and, as the authors acknowledged, may not be clinically relevant.

The authors’ conclusions reflect the evidence presented but given the concerns highlighted above, these conclusions should be treated with caution.

**Implications of the review for practice and research**

**Practice**: The authors stated that the selection of anti-pronation interventions should be based on patient characteristics, type of activity and personal preference.

**Research**: The authors stated that further randomised studies are necessary as the majority of the included studies in the
review did not use randomised allocation to treatments or sequence generation.

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