Author's response to reviews

Title: Effect of foot orthoses on lower extremity kinetics during running: a systematic literature review.

Authors:

Andrew McMillan (am3mcmillan-sexton@students.latrobe.edu.au)
Craig Payne (C.Payne@latrobe.edu.au)

Version: 3 Date: 31 October 2008

Author's response to reviews: see over
Effect of foot orthoses on lower extremity kinetics during running: a systematic literature review.

Andrew McMillan and Craig Payne

The principal author would like to extend his gratitude to Dr. Christopher MacLean for providing the opportunity of peer review, and for improving the manuscript accuracy. Please find below the reviewer’s report dated 8 October 2008, integrated with the author’s response to each suggested improvement. Additionally, the manuscript has been edited to improve the general writing quality.

Reviewer's report

Title: Effect of foot orthoses on lower extremity kinetics during running: a systematic literature review.

Version: 2 Date: 8 October 2008
Reviewer: Christopher MacLean

Reviewer's report:
Minor Essential Revisions

1) Clearly define customised foot orthoses is. This nomenclature has different meanings in different regions and should be clarified.

Response: The term ‘customised’ has been replaced with the term ‘custom-moulded’ throughout the manuscript, including tables. Tables 5 – 7 provide additional details of orthosis design.
2) Consider changing rearfoot pronation to eversion.

**Response:** The sentence using the term ‘rearfoot pronation’ in the Background has been removed. The removal of this sentence occurred as part of an overall edit, with the aim of improving the manuscript readability.

3) Please add resultant in front of joint moment and always clarify whether you are presenting internal or external resultant joint moments.

**Response:** The term ‘resultant’ has been inserted prior to ‘joint moment’.

4a) Under Rearfoot Inversion Moment (3rd pgh) Correction: reference 56 included only healthy subjects.

**Response:** Amended.

4b) Consider adding (MacLean et al. (2008), Clinical Journal of Sports Medicine 2008; 18: 338-343) where both healthy subjects and subjects with a Hx of injury were investigated.

**Response:** The systematic search occurred on May 7 2008, unfortunately the trial above was published in July 2008 and was therefore not included in the review. While this is regrettable, the above trial cannot be included in the review without updating the systematic search strategy. On reading the article, it seems the conclusions drawn in the systematic review would be relatively unaffected by the addition of this trial. For example, the trial reports a statistically significant reduction in the rearfoot inversion moment, in alignment with the findings reported in the review. Inclusion of the trial would indeed be of benefit to the systematic review, however the volume of work involved in updating the search strategy, and integrating any new evidence after methodological assessment is considerable. It is hoped the reviewer will understand that integration of the trial at this stage of development would be impractical.
5) Consider changing Normal to Healthy, throughout.

Response: The term ‘normal’ now appears in the manuscript once only, in paragraph 2 under Loading Rate and Peak Impact Force: “… with both normal and excessively pronated foot posture”. The principal author acknowledges the need for accurate descriptive terminology, and is of the view that the term ‘normal’ in this sentence is acceptable, as the term ‘excessively pronated’ appears in the same sentence.

Well done.

Level of interest: An article of importance in its field

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.
Effect of foot orthoses on lower extremity kinetics during running: a systematic literature review.

Andrew McMillan and Craig Payne

The principal author would like to extend his gratitude to Dr. Sharon Dixon for providing the opportunity of peer review, and for improving the manuscript accuracy. Please find below the reviewer’s report dated 12 October 2008, integrated with the author’s response to each suggested improvement. Each suggestion has been isolated from the text and allocated a number, with the author’s response appearing immediately below. Additionally, the manuscript has been edited to improve the general writing quality.

Reviewer's report

Title: Effect of foot orthoses on lower extremity kinetics during running: a systematic literature review.

Version: 2 Date: 12 October 2008
Reviewer: Sharon Dixon

Reviewer's report:

Major Compulsory Revisions

General Comments

This paper aims to explore literature regarding the influence of foot orthoses on kinetics. Following a systematic search of relevant databases, a small number of papers are identified which satisfy the inclusion criteria of the authors. The process followed to identify relevant papers appears comprehensive and logical.
1. There needs to be some justification for presenting a review that is based on just 10 papers, particularly when for some variables considered only one or two of these papers are considered.

**Response:** To meet the criteria for inclusion, trials were required to have investigated kinetic variables during running. However, the systematic review did not aim to investigate specific pre-determined kinetic variables.

2. The introduction section should present a clear argument for the focus on kinetic variables. Currently this is not the case. The argument seems to be that there appears to be no systematic change in kinematic variables and thus the authors propose to look at kinetics instead. This is not a strong argument.

**Response:** The third paragraph of the *Background* now includes the following sentence: “However at the time of writing, no systematic review evaluating the mechanism of action of foot orthoses during running had been published”. Also, the fourth paragraph of the *Background* now has emphasis on the need for a systematic review into lower extremity kinetics during running.

3. It is not clear from the detail provided on the review methodology exactly what process was performed to exclude some papers from the original 1801. In particular, did just one person assess the appropriateness, or was this process repeated by more than one person to improve confidence in the screening process? Similarly, was the reduction from 31 articles to 10 just performed by one person? If so, can this be justified?

**Response:** Paragraph three of the *Methods* section now specifies that only one author assessed the citations according to the inclusion and exclusion criteria. This systematic review was undertaken as part of an honours project in which marks were allocated according to student independence. The inclusion and exclusion criteria described in the Methods are specific and clear, with a low risk of subjective interpretation. However, the author acknowledges that repeated screening of articles by more than one person may have enhanced confidence. Please find below a table of the articles printed in full-text that did not meet the inclusion criteria. This table appears in the principal author’s thesis, but was not included in the review manuscript due to its’ large size and less meaningful content.
Additional table: Articles excluded after full-text review.

<table>
<thead>
<tr>
<th>Author</th>
<th>Date</th>
<th>Grounds for Rejection</th>
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<tbody>
<tr>
<td>Baitch et al.</td>
<td>1991</td>
<td>kinematic variables only</td>
</tr>
<tr>
<td>Bates et al.</td>
<td>1979</td>
<td>kinematic variables only</td>
</tr>
<tr>
<td>Blake &amp; Ferguson</td>
<td>1993</td>
<td>kinematic variables only</td>
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<tr>
<td>Eng &amp; Pierrynowski</td>
<td>1994</td>
<td>kinematic variables only</td>
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<tr>
<td>Ferber et al.</td>
<td>2005</td>
<td>kinematic variables only</td>
</tr>
<tr>
<td>Heiderscheit et al.</td>
<td>2001</td>
<td>kinematic variables only</td>
</tr>
<tr>
<td>Kawamoto et al.</td>
<td>2003</td>
<td>Japanese language</td>
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<tr>
<td>Morarty &amp; Agosta</td>
<td>1998</td>
<td>unpublished</td>
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<td>Mundermann et al.</td>
<td>2003</td>
<td>duplicate publication</td>
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<tr>
<td>Mundermann et al.</td>
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<td>Nawoczenski et al.</td>
<td>1995</td>
<td>kinematic variables only</td>
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<tr>
<td>Nigg et al.</td>
<td>1999</td>
<td>review article</td>
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<td>Nigg et al.</td>
<td>1998</td>
<td>kinematic variables only</td>
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<tr>
<td>O'Leary et al.</td>
<td>2008</td>
<td>cushioned insole only</td>
</tr>
<tr>
<td>Paton &amp; Spooner</td>
<td>2006</td>
<td>walking trial</td>
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<tr>
<td>Payne &amp; Chuter</td>
<td>2001</td>
<td>review article</td>
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<tr>
<td>Razeghi &amp; Batt</td>
<td>2000</td>
<td>review article</td>
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<tr>
<td>Reed &amp; Bennet</td>
<td>2001</td>
<td>walking trial</td>
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<tr>
<td>Smith et al.</td>
<td>1986</td>
<td>kinematic variables only</td>
</tr>
<tr>
<td>Stacoff et al.</td>
<td>2000</td>
<td>kinematic variables only</td>
</tr>
<tr>
<td>Zammit &amp; Payne</td>
<td>2007</td>
<td>walking trial</td>
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</table>

Introduction/Background

4. For much of this background section it is not clear why the detail is directly relevant to the purpose of the manuscript. The first paragraph commences with relevant detail concerning the frequency of running injuries, but then provides detail on the possible links between foot morphology and injury. This detail is not clearly linked to the subsequent focus on orthotics and kinetic variables, and thus does not support or justify the focus of the paper.

Response: Paragraph three of the Background now specifies that: “The clinical effectiveness of foot orthoses has been demonstrated in clinical trials for either the prevention or treatment of the
running-related conditions described above. However at the time of writing, no systematic review evaluating the mechanism of action of foot orthoses during running had been published.”

5. Similarly, the detail presented regarding links between kinematic variables and orthotic devices does not help to justify the resulting focus on kinetics. A more appropriate introduction would present a rationale for focus on the influence of orthotic devices on force/pressure/moments and thus make it clear why the authors want to evaluate evidence in this area.

**Response:** Please refer to the response for point 2.

**Review - Loading Rate**

6. Para 3 – according to table 4, papers 53 and 56 did not measure loading rate, but the results of these papers are included in this evaluation.

**Response:** All articles in Table 4 measured effects on both loading rate and peak impact force, with the exception of Butler et al, who did not measure effects on peak impact force. N/A appears in the peak impact force column (column 5) for Butler et al, to demonstrate this. The ticks and crosses in columns 4 and 5 correspond with the significant findings of the articles. Therefore, the titles of columns 4 and 5 have been adjusted to include the word ‘significant’ (Column 4: Significant effect on loading rate. Column 5: Significant effect on peak impact force).

7. Para 4 – it would be useful to identify the specific papers that have conflicting findings.

**Response:** References to Table 4 follow each sentence in which a comparison was made. This table was designed to demonstrate the specific papers that have conflicting findings. It is expected that Table 4 will be inserted close to this paragraph for publication.

Please also note that paragraph 5 has been merged with paragraph 4 as both paragraphs describe comparisons.
8. Para 5 – I suggest an alternative word to ‘significant’, as this suggests some statistical analysis has been performed.

Response: The terms ‘systematic’ and ‘non-systematic’ have been used as replacements.

9. Para 6 – given the wide range in orthotic prescription and fabrication methods, are you confident that the orthoses used in different studies are equivalent?

Response: The term ‘similar’ has replaced the term ‘equivalent’.

Review – Rearfoot Inversion Moment

10. Para 2 – Can it be assumed that all three papers have reported the same finding when one of the three papers and one condition from a second paper did not reach significance?

Response: The first sentence of paragraph 2 now states that “All three trials investigating the effect of foot orthoses on rearfoot inversion moments demonstrate a consistent trend.”

11. Para 3 – please confirm whether you are referring to within or between subject consistency in running style of the participants.

Response: The final sentence of paragraph 3 has been removed.

Review – Plantar Pressure

12. I believe Van Gheluwe and Dannanberg (JAPMA, 2004) considered the influence of orthotic devices on in-shoe pressure. Is there a justification for omitting this paper from the review? I guess the question may be – how was ‘orthotic’ defined?
Response: The trial conducted by Van Gheluwe and Dannanberg (J Am Podiatr Med Assoc. 2004 Jan-Feb;94(1):1-11.) involved subjects walking, as opposed to running. Therefore this trial did not meet the review inclusion criteria.

13. Para 3 – Paper 60 utilised a pressure plate (not a force plate).

Response: The term ‘pressure-plate’ has been inserted.

14. In contrast to the suggestions of the authors, I believe that the different results for the papers 60 and 61 may be explained by the use of a pressure plate in one study and a pressure insole in the other. The pressure insole will detect load at the plantar surface of the foot. Thus, the presence of a device that is higher in the medial area of the foot will likely produce a higher load on the medial aspect owing to the device applying pressure in this area. In contrast, measurement beneath the shoe will provide detail on the balance of pressure on the medial-lateral shoe, and thus will not necessarily detect a higher load on specific areas of the plantar surface of the foot. This measurement procedure is more likely to detect a shift in movement to a less everted position, despite higher pressure on the medial aspect of the foot.

Response: The final sentence in paragraph 3 has been removed. Also, the conclusion in paragraph 4 has been adjusted to state that: “detection of effects may depend on the interface at which pressure is measured”. Paragraph 4 has been edited to remove speculation regarding the potential therapeutic value of pressure distribution, and the potential relationship between pressure distribution and the rearfoot inversion moment.

Review - Timing of Peak Force and Pressure

15. It is not clear why timing of peak force is considered separately to loading rate?

Response: The principal author is of the understanding that the loading rate may be altered by both peak impact force magnitude and peak impact force timing. Peak impact force timing is therefore a distinct kinetic variable, and has been reported in isolation from magnitude and loading rate.
16. Para 1 – please provide further explanation on the demonstration of a relationship between peak impact force and loading rate by the presented data.

Response: The sentence in paragraph 1 referring to a relationship between the variables has been removed.

17. Para 2 – paper 60 appears to present data on the peak lateral and medial pressure timings. It is not clear that data are provided on the peak forefoot pressure. Which specific variable from the paper is being referred to here? Is this variable claimed to represent the start of the propulsion phase?

Response: The principal author has misinterpreted the variables ‘medial foot balance occurrence time’ and ‘lateral foot balance occurrence time’. The author misinterpreted these variables as representing the forefoot, due to interpreting the variables ‘medial heel balance occurrence time’ and ‘lateral heel balance occurrence time’ as representing the rearfoot.

Reference to the article by Dixon & McNally (2008) has been removed from discussion under Timing of Peak Force and Pressure. This section has been re-titled ‘Timing of Peak Impact Force’ and only includes the article by Dixon (2007).

18. Para 3 – since there is only one study presented with each methodology, I am not convinced that there is ‘consistency’ in the findings.

Response: The statement has been removed.

Review – Force/Time Integral

19. Please explain in more detail the variable impulse and how a reduction and delay in impact peak may be used to infer this variable.

Response: The sentence inferring a relationship between these variables has been removed.
**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**
'I declare that I have no competing interests'