

Author's response to reviews

Title: Foot posture influences the electromyographic activity of selected lower limb muscles during gait

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Author's response to reviews: see over

29th October 2009

Dr Alan Borthwick
Deputy Editor (UK)
The Journal of Foot and Ankle Research Editorial Team

Dear Editor,

Thankyou for providing the comments from your reviewers. We are grateful for the comments raised by the reviewers and have revised the manuscript with these in mind - we have responded on a point-by-point basis below. Each text-box contains the specific suggestion or query made by the reviewer and this is followed by our response

Yours truly,

George Murley

RESPONSE TO REVIEWERS COMMENTS

Reviewer #1

1. 47 is not young. Subjects were on average young, but with a range up to 47 years of age perhaps different words should be used.

1. Authors' response

We agree that 47 years of age is not necessarily young. This sentence has been revised and now reads (page 4, line 79):

Sixty adults aged 18 to 47 years were recruited to this study.

2. Data processing - you do not detail rectification/filtering to get envelope of data which you use for calculation of peaks etc.

2. Authors' response

The absence of important EMG processing details was an oversight and we have now included this information (page 7, line 141-144):

EMG data from the MVICs and walking trials were full wave rectified and low pass filtered at a cut off frequency of 6 Hz through a 4th order Butterworth filter with phase lag.

3. Results - contact phase peroneus longus and tib post means swapped compared to table 2.

3. Authors' response

The means for peroneus longus and tibialis posterior during contact phase were back-to-front and this is now corrected.

4. Discussion para 2 page 10. You use the term 'more repetitive loading'. Is this a greater number of repetitions, a greater load or both? The structures are loaded each stride, or they are not, or are they loaded and unloaded and then loaded again each stride? Is this different between flat foot and normal groups?

4. Authors' response

Upon reflection, we recognise the phrasing ‘more repetitive loading’ is vague and does not convey the intended explanation for our findings. This paragraph has been revised and now reads (page 10, line 233-236):

One explanation for our findings is that the medial longitudinal arch and its supportive structures (e.g. ligaments) of a flat-arched foot may undergo greater loading during walking, compared to the normal-arched foot. Greater loading of the medial arch would require additional work from tibialis posterior to protect the arch structures from excessive tissue stress and injury. While cadaveric research has shown an increased loading of the foot’s medial structures with simulated tibialis posterior tendon dysfunction [21], it is also possible that these events can occur in reverse, that is, the flat-arched foot may place a greater demand on tibialis posterior.

5. Figure 5. Why do you present only the average using one set of data from each subject and not all sets from all subjects to match the table data? Are the lines mean with stdev or CI?

5. Authors’ response

The ensemble curves presented in Figure 5 were processed separately to the main analysis to provide a visual depiction of the EMG signal over a gait cycle. While we acknowledge in the figure caption that the ensembles graphs were based on a single step for all participants, we felt these graphs provide a fairly accurate account of our main findings. To add clarity to the meaning of the lines in these graphs, the following details have been added to the figure caption:

Solid lines – mean amplitude; shaded area surrounding solid line – 95% confidence interval.

Reviewer #2

1. Methods

EMG: Where were the indwelling & surface electrodes placed; what system/systems was/were used to collect the signals; how were the data processed before analysis (e.g. linear envelopes)? Although reference provided these details should be included

1. Authors' response

The absence of important EMG processing details was an oversight and we have now included this information (page 7, line 158-161).

EMG data from the MVICs and walking trials were full wave rectified and low pass filtered at a cut off frequency of 6 Hz through a 4th order Butterworth filter with phase lag.

However, with respect to the lack of detail describing intramuscular electrode positioning, we feel our reference to previous work and the video supplement (i.e. video supplement 1) is sufficient for the reader to be convinced that the EMG protocol was accurate.

2. MVIC parameters: which movements were assessed? Provide additional details on MVIC collection and analysis

2. Authors' response

The following addition information has been added to the methods section regarding the MVIC procedure (page 7, line 139-146):

Each participant was instructed to perform a maximum contraction against the resistance of the tester and was given verbal encouragement while doing so. The resisted movements included; supination – tibialis posterior, pronation – peroneus longus, dorsiflexion – tibialis anterior, plantarflexion (knee extended) – medial gastrocnemius. The participant sat on a bench while performing the MVICs for tibialis posterior, tibialis anterior and the peroneal muscles. For the medial gastrocnemius MVICs, the participant sat on the floor with their back against a wall, to ensure the participant did not slide backward during the contraction.

3. Statistics: How did you determine normal and flat-arched groups (ie using all clinical and radiographical tests or something different?). Discuss use of clinical and radiographical tests to determine foot posture

3. Authors' response

The information below has been added regarding the clinical and radiographic measurements (page 4, line 86-96). In addition, the foot screening the protocol has been published and is freely accessible to anyone who wants further detail.

To qualify for the normal-arched foot group, participants had either a normal arch index or navicular height measurement, and their four radiographic measurements were within a normal range. To qualify for the flat-arched group, participants had an arch index or navicular height measurement greater than two standard deviations from mean values obtained for the normal-arched group. Furthermore, their radiographic measurements were greater than 1 standard deviation from the mean values obtained for the normal-arched group for either the sagittal and or transverse plane measurements.

4. Results

Check reported data – there are errors in text when compared to Table.

However, if data are in table do not repeat in text

Delete reference to medial gastrocnemius in the contact phase as was not assessed

4. Authors' response

The means for peroneus longus and tibialis posterior during contact phase were back-to-front in text and this is now corrected (see also Author's response 3 to Review 1). The reference to medial gastrocnemius in contact phase is now deleted.

Only the significant findings are presented in both the table and in text. As there are no limits to the number of tables or words in JFAR, we would prefer to keep this structure.

5. Discussion

• Page 10; Line 2: What do you mean by repetitive loading? Terms of “repetitive loading”, “overload” and “abnormal loading” have been used freely throughout the manuscript. It could be argued that these terms have distinct differences yet they have been used very generally in this discussion and may not correctly represent your findings or discussion. Please be specific about what you mean by these statements and provide evidence from the literature. Make sure you do not take too large a leap from your results.

5. Authors' response

Upon reflection, we recognise the phrasing ‘more repetitive loading’ is vague and does not convey the intended explanation for our findings (see also Author’s response 4 to Review 1). This paragraph has been revised and now reads (page 10, line 233-236):

One explanation for our findings is that the medial longitudinal arch and supportive structures (e.g. ligaments) of a flat-arched foot may undergo greater loading during walking, compared to the normal-arched foot. Greater loading of the medial arch would require additional work from tibialis posterior to protect the arch structures from excessive tissue stress and injury. While cadaveric research has shown an increased loading of the foot’s medial structures with simulated tibialis posterior tendon dysfunction [21], it is also possible that these events can occur in reverse, that is, the flat-arched foot may place a greater demand on tibialis posterior.

6. Page 13; Limitations: include problems with using a static (presumed as no details provided) MVIC to normalise dynamic movements which could occur with different kinematics.

6. Authors' response

The following information has been provided in the limitations section of the discussion (page 14, line 323-326):

A further limitation was that we used MVICs to normalise the EMG amplitude parameters. It is difficult to control and monitor the participants’ effort or output with MVICs which may be a factor that leads to greater between-participant variability compared to other normalisation protocols [20].

7. Table 1

- Don't include the clinical and radiographic measurements as they are not described anywhere in the manuscript. Either refer to them or delete

7. Authors' response

We would prefer to retain the clinical and radiographic foot posture measurements presented in the table. As such, the following information has been added to the methods and results sections:

(Methods; page 4, line 86-88) *This protocol was derived from normative foot posture values for two clinical measurements (the arch index and navicular height) and four angular measurements obtained from antero-posterior and lateral x-rays (talus-second metatarsal angle, talonavicular coverage angle, calcaneal inclination angle and calcaneal-first metatarsal angle).*

(Results; page 8, line 183) *The normal- and flat-arched foot posture groups were matched for age, gender, height and weight, with no significant differences for any of these characteristics except for the clinical and radiographic measures of foot posture (Table 1).*

8. Figure 1

- Not required – just reference method

Figure 2

- Not required – just reference method

Figure Captions

- Figures 1 and 2 are not required

8. Authors' response

We respectively disagree with this suggestion. JFAR has no restrictions on the number of tables or figures included in published manuscripts. Therefore, we believe that if this paper is published in JFAR then readers may find the figures useful for interpreting our paper.

9. Introduction:

- Page 4, Line 7: change "this data" to "these data"

9. Authors' response

'This' data has been changed to 'these' data

10. Methods

- Clinical and radiographical tests of foot posture: Figures 1 and 2 detail common assessments, figures not required.

10. Authors' response

Please refer to author's response 8 above.

11. Page 6; Line 11: insert space between "9m"

11. Authors' response

A space has been added between "9m", so it now reads '9 m'.

12. Page 6; Line 17: delete "the" so reads "...were undertaken..."; delete "which" so reads "...comprised of a gradual..."; change "two-second" to "2 s"

12. Authors' response

All of these changes have been performed.

13. Page 6; Line 18: change "2-second" to "2 s"

- Page 6; Line 19: change "1-minute" to "1 min"
- Page 6; Line 20: change "2-second" to "2 s"
- Page 6; Line 25: change "13-second" to "13 s"

13. Authors' response

All of these changes have been performed.

14. Results

- Page 8; Line 3: in the table you use "gender" rather than "sex" please be consistent

14. Authors' response

The text has been changed to gender.

15. Include discussion of high variability within data, particularly for indwelling EMG

15. Authors' response

We agree that some acknowledgement of the issue with random variability for tibialis posterior EMG amplitude is required. Accordingly, the following details have been added to the discussion section (page 10, line 226):

Despite the issue of random variability for tibialis posterior EMG amplitude during gait [14, 20], our results provide strong evidence to indicate that tibialis posterior is working harder (i.e. as a percentage of a maximum contraction) during midstance/propulsion in participants with flat-arched feet, compared to those with normal-arched feet.

16. Present effect sizes in results

16. Authors' response

Effect sizes have been added to the results.

17. Page 8; Line 11: presume by "EMG amplitude" you refer collectively to "peak EMG amplitude" and "RMS amplitude" but a little confusing

17. Authors' response

We agree this is a little confusing. The sentence has been amended and now reads (page 9, line 189):

Statistically significant differences in peak and RMS EMG amplitude were detected for tibialis posterior, peroneus longus and tibialis anterior. There were no significant differences in EMG time of peak amplitude.

18. Discussion

- Page 9; Line 11: change "effect" to "effects"

18. Authors' response

'Effect' has been changed to 'effects'.

19. Page 9; Line 21: insert "for tibialis posterior" before "were 0.68 and 0.69"

19. Authors' response

As suggested by the reviewer, 'for tibialis posterior' has been added before 'were 0.68 and 0.69'.

20. Page 11; Line 23: insert space between “0.11ms”

20. Authors’ response

This change has been made.

21. Page 13; Line 11: “previous studies” are mentioned yet only one reference is provided; are you referring to one or two studies?

21. Authors’ response

The single reference was for a published systematic review that had summarized the evidence from the literature. The original references have now been added.

22. References

Check references for consistency in formatting and use of capitals

22. Authors’ response

The references have been checked for formatting and use of capitals

23. Table 1

Change walking velocity; do not repeat m/s in variable column just use walking velocity

23. Authors’ response

This change has been made.

24 What is the left/right foot count?

24. Authors’ response

‘Left or right foot count’ indicates the number of participants whose left or right foot was suitable for inclusion in their respective group (i.e. normal-arch or flat-arch). The following note has been added to the table footnote to clarify this point:

^{FC} denotes the number of participants whose left or right foot was suitable for inclusion in their respective group (i.e. normal-arch or flat-arch).

25. Check spaces between number and units in table footnote

25. Authors' response

The spacing between numbers and units in table footnote have been checked again.

26. Table 2

- Do not repeat data in text

26. Authors' response

Please refer to author's response 4.

27. Figure 5

- Highlight the phases on the curves; font size is exceptionally small

27. Authors' response

We agree that the font was too small in Figure 5 and have increased the size as suggested. However, we are reluctant to overlay the phases onto the graph because we feel this may clutter the graph further.

Reviewer 2 - Discretionary Revisions

28. Introduction:

Page 4, Line 7: change "this data" to "these data"

28. Authors' response

'This' data has been changed to 'these' data

29. Page 4, Line 12: perhaps merge this sentence/paragraph with the above

29. Authors' response

We feel the paragraph containing the 'objective' of the study requires a new paragraph and have kept this separate from the previous sentence/paragraph.

30. Results

More indication of the actual data would be good

30. Authors' response

We have provided the mean differences, confidence intervals, p-values, effect sizes and figure 5 containing EMG signal. We feel this provides an adequate account of the actual data.

31. Although male and female data were collected there is no reference to any gender differences. Were there any that should be discussed?

31. Authors' response

We did not examine the data for differences between male and female subgroups, as we have no reason to believe that they would be different, and doing so would double the number of inferential statistics used with the potential for increasing the chance of Type 1 statistical error.

32. Discussion

Page 10; Line 1: delete "its" at end of line

32. Authors' response

As suggested 'its' has been removed.

33. Page 11; Line 7: make "plantarflexion" two words

33. Authors' response

To be consistent with majority of the biomechanical literature, 'plantarflexion' has been retained as a single word.

34. Page 11, Line 24: delete "potentially"

34. Authors' response

As suggested 'potentially' has been deleted.

35. Table 1

- Check use of full-stop in caption

35. Authors' response

The use of full-stop in caption has been checked.