Author's response to reviews

Title: Does flip-flop style footwear modify ankle biomechanics and foot loading patterns?

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Version: 2
Date: 7 June 2014

Author's response to reviews: see over
General Response: Overall in response to the reviewer’s comments, the aims of the paper have been re-written and the results re-structured and better focused to the study aims and hypotheses. Some of the paper has been re-worded to make the language clearer and/or better relate to the study aims.

Reviewer's report
Title: Does flip-flop style footwear modify ankle biomechanics and foot loading patterns?
Version: 1 Date: 16 March 2014
Reviewer: Angus Chard

Response: The grammatical recommendations have been altered to match suggestions from reviewer 1. We will respond to the revisions which relate to other aspects of the paper more specifically.

- Major Compulsory Revisions
  1. Grammatical improvements are required throughout the paper.
     a. Delete or substitute the 13 uses of “also”.
     b. Consider alternatives to the 6 uses of “apparent”.

  2. Background
     a. Paragraph 1
        i. Change “UK” to United Kingdom
        ii. Change “lesser-toe” to second toe
     b. Use of the word “because” is inappropriate for scientific writing.

  3. Background, Paragraph 1
     a. Rewrite with references following statements.

  4. Background, Paragraph 2
     a. Rewrite with the primary statement leading the paragraph
        Response: This has been re-written as recommended in your later comments and also now written as two paragraphs to better establish and relate to the aims of the paper.

     b. Rewrite sentence starting; This was attributed to a … for improved clarity.
        Response: This has been re-written as recommended.

  5. Background, Paragraph 3
     a. First sentence appears unsubstantiated, needs reference.
     b. Delete “alludes”
     c. Requires reference
        i. The FitFlop was originally developed to increase muscle activation in the lower limb by incorporating a soft mid-foot to induce instability within the midsole design.
        Response: A reference was added, the only relevant one available is unfortunately a website.

  6. Background, Paragraph 4
     a. Re-write; exclude point form and speculations among the hypothesis.
        Response: The point form of the hypothesis section has been removed leaving a paragraph. It is hoped that the “speculation” of the hypothesis has been reduced by the inclusion of additional information as recommended by reviewer three to better demonstrate the nature of the hypothesis. The hypotheses relating to the FitFlop footwear have been kept, but have been re-worded to be better supported by
the themes and literature presented in the introduction. These are key to the aims of the paper, which are now clearer and defined in the introduction (Page 5 Paragraph 3 The current...).

7. Methods, Participants, Paragraph 1
b. Greater detail describing inclusion exclusion criteria of sample i. This is necessary due to the use of “generalizable” within the discussion.
Response: Further description of the participants has been included to this section (Page 6 Paragraph 2 Forty participants.....); however no specific measurements of foot structure etc. were taken. This is an inherent limitation to generalizing the study outcomes to specific groups, but means they can be applied to the broader asymptomatic population.

8. Results
a. Greater clarity is required regarding the FitFlops results.
i. If the male and female FitFlops are different in design where their results combined for reporting?
Response: The data from the female and male participants was grouped for comparison, despite the differences in the footwear between genders. This is due to this being the resultant influence of the footwear on a mixed-gender population. We have defined this in the method (Page6, Paragraph 3, The male and female....) alongside a more thorough explanation of the differences between the styles, as recommended by reviewer 3. We recognise this as a limitation of the research (Page 14 Paragraph 1 This is a limitation....), however, and could explore this relationship and gender differences and interactions in future research.

9. Discussion
a. Re write for clarity. Take care to reduce speculation outside of the experiment.
Response: Sections of the discussion have been re-written as recommended and requested, these will be highlighted in the specific responses later.

b. Recommend deletion or greater detail of the participants.
i. “This suggests that results are generalizable to adults walking in flip-flop and FitFlop footwear in a real-world environment.”
Response: additional information being added to the participant description, please see comment above.

10. Conclusion
a. Tightening of report experiment findings and their immediate consequences are required.
Response: the conclusion has been altered to be more concise and directly related to the study findings (Page 15 Paragraph 2).

11. Discussion, Paragraph 2
a. Speculation, if no data delete;
i. The authors attributed their finding to contraction of the toe flexors to hold the flip-flop, creating a plantar-flexor moment at the ankle, however no electromyography data was collected.
Response: This section has been re-worded but not deleted. We consider it important to include some details, including “speculation” if they represent what may be clinician or wearer–opinion of the footwear style or theories relating to the mechanisms of overuse injury or symptoms induced by wearing this footwear style.

12. Discussion, Paragraph 3
a. Recommend you find another way to say;
i. “no real upper” or provide a thorough description of the FitFlop strap and why it is realer.
Response: the wording has been altered to describe the upper more fully as “thin, loose fitting”. Also the reader has been referred to the Figure at the end of this sentence (Page 13 Paragraph 1 The flip-flop condition….). The FitFlop upper is not in question here and therefore the thorough description of this upper has not been added to this section. This is in the following section and a more thorough description of the FitFlop upper has been included in the methodology section (Methods Paragraph 2 The FitFlop……).

13. Discussion, Paragraph 6
a. Change reference format from superscript
i. “….structures of the foot as protective materials. A plantar pressure study has also suggested that results show the flip-flop protecting the body at heel-strike compared to barefoot.9 “
Response: this has been altered, thank you for highlighting this error.

References
14. Reference 5 needs all authors
- Minor Essential Revisions
15. Abstract, Conclusion
c. Delete “Overall it is apparent that the”
d. I recommend this sentence removed or altered as the upper strap dimension have not been described, nor has the profiled footbed been described “These changes may be attributed to design features of the footwear such as a thicker upper strap and a thicker and profiled footbed compared to a standard flip-flop design.”
16. Background, Paragraph 1
e. Despite the popularity of the footwear style, localised heel pain
i. Delete “localised”
f. Flip-flops break recommendations for footwear by being thin, not supporting the medial arch, not protecting the toes, having a loose fitting upper and having no pitch from heel to toe [2,3].
i. Change: “break” to deviate
Response: This sentence has been re-worded in-line with this comment and further comments from other reviewers (Background paragraph 1, Flip-flops differ from…..).

g. Suggest you re write final sentence for clarity: Despite the popularity of flip-flops in warm climates, limited scientific investigation into their influence on adult gait has been published
h. Suggest you re write 2nd paragraph for clarity: Children wearing flip-flops display a trend towards a more dorsiflexed, everted and abducted midfoot during walking compared to barefoot [4] and reduced hallux dorsiflexion prior to contact during walking and jogging and in adults reduced eversion during walking midstance, compared to barefoot [5,6].
Response: We appreciate your recommendation and have re-worded the first section of this sentence as you recommended, however the third section referring to adults does not make sense when incorporated into a sentence about the influence of the footwear style on children’s gait. The influence on adult gait has been included as a spate sentence (Background, paragraph 2, Reduced eversion…..).

17. Background, Paragraph 3
i. This statement should be in the first paragraph as defines the main difference of fitflops
i. The footwear encompasses a thick multi-density EVA footbed with a wide and high-fitting flip-flop upper, these features may reduce gait modifications and make this footwear a suitable alternative to a flip-flop. However, gait motion in this footwear compared to a flip-flop comparator is yet to be fully investigated.
Response: This section has been moved earlier in the paragraph in which it original was included (Background Para 4, The FitFlop was….). We consider it to be important, and to be a better structure to the introduction, to first introduce flip-flop style footwear and related literature and progress to introducing the alternative.

18. Background, Paragraph 4
a. The current research therefore aims to investigate gait kinematics, kinetics and electromyography when walking barefoot and in a flip-flop and identify whether walking in a FitFlop is significantly different. It is hypothesised that:
   i. Delete, “therefore” and “:”
   Response: This section has been largely re-written.

19. Methods, Participants
a. All indicated they were healthy and free of injury…
   i. More detail if available if free of injury for preceding six months, foot posture? (flat feet or cavus feet etc)
   ii. The sample advertised to participate if so how or was this a convenient sample
   Response: the status of the sample has been altered to include reference to the nature of the participants as university staff and students. Additionally the inclusion criteria has been re-worded to provide further detail (Methods, Paragraph 1).

20. Statistical Analysis
a. Which version of SPSS was used?
   Response: Added V17

21. Results, Frontal plane ankle in stance
a. “Despite the aforementioned alteration in Gastrocnemius activation in stance and Tibialis Anterior activation in swing, the Peroneus longus and soleus activation Did not differ between conditions during stance (Figure 2).”
   i. If not significant, I recommend deletion and moved to discussion
   Response: this section has not been moved to the discussion as suggested, but has been re-worded to be a relevant and concise result only and consistent with the sub-section of results for which it is relevant.

22. Discussion, Paragraph 1
a. Should “, and any modifications” say FitFlops?
   Response: The statement has been altered to refer to modifications when walking in “flip-flop style footwear” to encompass both shod conditions within this research study and relate to the primary aim of the research, to compare walking barefoot to walking in flip-flop style footwear

23. Discussion, Paragraph 2
a. Reword for clarity
   i. “The uppers both only cover the front of the foot. Without a heel strap, gait may be adapted to hold the shoe on the foot [8].”

24. Discussion, Paragraph 2
a. Speculation, if no data delete;
   i. The authors attributed their finding to contraction of the toe flexors to hold the flip-flop, creating a plantar-flexor moment at the ankle, however no electromyography data was collected.
   Response: this statement has not been deleted as it is important to consider and discuss thoughts and “speculation” which may be evident in peers regarding the influence of flip-flop style footwear on gait. We have slightly re-worded this section for clarity. Additionally, some information, however has been deleted from this paragraph such that the emphasis on other research and “speculation” is reduced (Discussion Paragraph two).
25. Conclusion  
   a. Recommend Deletion  
      i. “suggesting that the footwear may be more suitable for daily wear than a standard flip-flop.” without strengthening Participant description.  
      Response: further detail has been added to the participant description in the method. However, as recommended, we have deleted this section from the conclusion.  

   b. Further detail describing the difference in upper and footbed within the manuscript are necessary for this inclusion;  
      i. “The results identify that altering the upper positioning and size and the footbed shape may reduce gait modifications in flip-flop style footwear.”  
      Response: this section was removed. As suggested by Review 3, systematic modifications of dependent variable (design features) and their influence on independent variables would have better captured this aspect of the inferences from the study. Therefore, despite including a more thorough description of the footwear conditions in the methods, we removed this line.  

   - Discretionary Revisions  
26. Background, Paragraph 4  
   a. Suggest you change use of “to keep the footwear on”  
      i. To maintain the footwear  

27. Ankle angle swing: Shod conditions will increase ankle dorsiflexion, and tibialis anterior muscle activation, in swing compared to barefoot to keep the footwear on during swing. This increase in dorsiflexion is expected to be less in FitFlop than flip-flop due to the upper size and fit.  
   b. Delete, “Ankle angle swing:”  
   c. Delete, “. This increase in dorsiflexion is expected to be less in FitFlop than flipflop due to the upper size and fit.”  
      i. etc  
      Response: Ankle angle swing has been deleted as suggested, alongside the re-formatting of the hypothesis section. The second sentence has been kept as this relates to the (now more explicit) aim to compare walking in flip-flops to FitFlops within this paper, however we have reworded this sentence for clarity (Background Paragraph 5, Firstly, it is hypothesises…..).  

28. Method, Protocol  
   d. Data from the right leg only was used for all analysis.  
      i. Delete “only” and “all”  

29. Results  
   e. Recommend delete headers; Ankle angle swing, Frontal plane ankle in stance and Loading rate  
      Response: The headers have been kept but the sections better structured in response to the other reviewers comments. The data not relating specifically to the heading has been removed and thus the structure of the results is far clearer and fits with the discussion structure.  

   f. Recommend delete “aforementioned”  
30. Discussion, Paragraph 2  
   a. Reword for clarity;  
      i. A previous study has also suggested that plantar pressure analysis discounted gripping of the flip-flop by the hallux in swing to control the flipflop [9], however the analysis undertaken may not have been sensitive to pressures in swing. Arecent plantar pressure analysis has identified gripping in swing in both flip-flops and FitFlops [11]. The FitFlop demonstrated reductions in magnitude and duration of gripping [11], potentially reducing any resultant plantar-flexor moment at the ankle, allowing greater dorsiflexion compared to the flip-flop. Inferences from the current data and
literature imply that ankle dorsiflexion and toe flexion may combine to hold toe-post footwear on the foot during swing, however toe motion must be quantified to confirm this.

Response: As aforementioned, this paragraph has been reworded to be clearer with some of the information removed (Discussion, Para2).

31. Discussion, Paragraph 3
a. Consider changing “contradictory” to inconsistent

32. Discussion, Paragraph 3
a. This point may be strengthened;
i. This may be potentially beneficial to wearers and may, in-part, explain positive testimonials from consumers as excessive frontal plane motion of the ankle has been repeatedly linked to overuse injuries [20,21].
Response: Thank you for the additional reference to re-enforce the point within the discussion regarding injury. This has been added the references altered accordingly.

33. Discussion, Paragraph 6 Loading Rate
a. This point may be strengthened;
i. Explanation of increased heel velocity in this shoe style may be proprioceptive due to the shoe leaving the foot at the heel, or due to protective kinematic adaptations in barefoot gait to reduce impact energy, as apparent in running [25];
Response: Thank you for your suggestion. We appreciate that a softer surface increases vertical impact magnitude in this running-simulating situation (and therefore could be utilised to justify the increased heel-velocity in this study in footbeds when barefoot is comparatively “hard” in this instance). This is a consistent interpretation and explanation as the paper we had referenced. However, we do not consider an additional paper to be the next logical reference or step for this argument. The increased heel velocity that we see within this paper has previously been identified as likely being due to the upper of the footwear (in our previous research) as opposed to the footbed (as discussed in the paper above). To clarify this continuation we have added to the above sentence “may be a result of kinematic changes due to the upper” (Discussion Paragraph 6 Loading Rate). We have therefore added a reference to our prior paper which identified this difference.

b. Consider rewording
i. “as opposed to at”

34. Discussion, Paragraph 6 Loading Rate
a. The FitFlop absorbed greater shock at heel-strike, evident by 19% and 15% reductions in loading rate and impulse compared to flip- flop, with strong effect. This is likely due to the thicker construction of EVA in the heel section of the FitFlop compared to flip-flop and likely reduces the potential for skeletal injury during walking [26,27].
i. Does this support Shore A hardness scores reported in table 2
1. Recommend you discuss the Shore A results.
Response: Thank you for your recommendation, reference to the hardness of the material has been made within the discussion, although the influence of thickness is a more influential determinant of the shock absorption properties of the shoe. We have referred the reader back to table 2 (Discussion Paragraph 6 This is likely…..).

Level of interest: An article of importance in its field
Quality of written English: Needs some language corrections before being published
Statistical review: Yes, but I do not feel adequately qualified to assess the
Declaration of competing interests:
I declare that I have no competing interests

Reviewer's report
Title: Does flip-flop style footwear modify ankle biomechanics and foot loading patterns?
Version: Date: 30 April 2014
Reviewer: Katherine Burgess

Reviewer's report:
Overall this paper is well written and provides novel information of interest to the field based on sound and robust methodologies. My recommendations for revision below are therefore to aid in the clarity of the manuscript and therefore enhance the readability; I would therefore describe them as minor essential revisions.

Abstract.
P2 Line 2: suggest changing ‘modify gait’ to ‘cause modifications in gait’ as the original sentence does not flow due to grammatical errors.
Response: altered as suggested.

P2 Line 3: you start with ‘therefore’ but you have not introduced the fit flop and why this might be better/different, therefore the reader does not know what this is or why you would want to compare it.
Response: As also suggested by reviewer 3, a sentence has been added to describe the FitFlop in the abstract (Abstract Line 4-5).

P2 Line 8: you state ‘including’ but then list all the muscles, why not just state them all in the first place?
Response: the abstract has been altered to just refer to electromyography in the abstract and the specific muscles tested identified in the methodology of the paper (abstract line 10).

P2 Line 23: you use the phrase ‘toe-post style footwear’ but you don’t use this anywhere else, you always refer to it as flip flop style so I would suggest changing it to this for consistency.
Response: altered as suggested.

Background.
The background presented provides a clear overview of the area and rationale for the study.

Methods
Figure 1: Please label the photos A, B & C to correspond with the legend. I would also recommend re-taking the two photos of the fit flops with a completely white background for contrast as these pictures are unclear in black and white as they are.
Response: we have uploaded a new figure and correctly labelled the separate images within this.

In the methods you define your phases of the gate cycle for your EMG analysis but not your kinematic variables.
Response: the phases of gait were not separated for the comparison of kinematic data, the peak data were calculated as included in the methodology (Method Para 5, Peak values…).

Results.
The way you have presented your results is confusing. You use subheadings but then present results which differ from this heading.
For example, you have a subheading ankle angle in swing but then present data regarding EMG in the stance phase.

The way you have used these subheadings in the discussion makes sense and I realise they are aligned to the hypothesis but the way this is expressed in the results is not clear.
Response: The results section has been restructured such that the headings only have data relating to the heading within the section. Additional data has been removed and the results re-structured. For example, the section discussing gastrocnemius EMG in stance has been removed due it not aligning with the hypothesis (Results, Para 1).

Discussion
P10 line 25: in this overview of the aim of the study you do not mention the fit flop only that flip flop was compared to barefoot.
Please ensure you accept/reject all you hypothesise, you have only done this explicitly for hypothesis 1
Response: This sentence has been re-written to include reference to the comparison of flip-flop and FitFlop to barefoot (Discussion, Para 1). Additional words have been added to the loading rate (Discussion, Para 4, both of which.....) and Frontal plane ankle in stance (Discussion, Para 2, As anticipated....) sections to refer to whether the hypothesis was accepted/rejected for each.

P14 line 23: you have reference using a superscript rather than a square bracketed number.
Response: altered, thank you.

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.
Declaration of competing interests:
I declare that I have no competing interests

Reviewer's report
Title: Does flip-flop style footwear modify ankle biomechanics and foot loading patterns?
Version: 1 Date: 8 May 2014
Reviewer: Sharon Dixon
Reviewer's report:
Major Compulsory Considerations

General
1. Performing a study to compare barefoot, flip-flop and FitFlop seems useful. However, in its current form, the aims and focus of the manuscript are difficult to justify. There is a strong suggestion that the tested FitFlops may provide an alternative to the traditional flip-flop. Consideration of the images provided in Figure 1 highlights that these are completely different footwear items, and would appeal to totally different markets. I cannot see a teenager attracted to wearing a Havaiana flip-flop considering the illustrated FitFlop as a realistic alternative (although I am no expert in fashion). Comparing both of these footwear types to barefoot could provide useful information, but I do not think for the reasons presented.
Response: Thank you for your comments. We appreciate that, for some consumers, the FitFlop does not appear an obvious replacement for the Havaiana flip-flop. Especially as you highlight, for younger wearers in the UK. However the functions of the two items of footwear are the same (in that they are open, summer footwear items in a flip-flop style) and there are no data to suggest that
teenagers do not wear this new type of footwear style. However, given that over 21 million pairs of the shoes have been purchased, one would expect that the age range would be wide.

2. The specific aim of the study is unclear. In parts, it seems to be to find an alternative to the traditional flip-flop by comparing it with FitFlop, whilst in other sections it is to compare both footwear types with barefoot. The start of the discussion section suggests the aim is to compare flip-flop with barefoot and with FitFlop. What is the aim?
Response:
The aims of the study have been presented more clearly throughout and the wording of the aim made consistent throughout the paper.

There is minimal data considering walking in flip-flop style footwear. Specifically, how the footwear styles influence gait in ways which may be interpreted by clinicians as being detrimental to foot and lower limb health has not been extensively, quantitatively compared. Therefore kinematics, kinetics and electromyography data have been collected and compared to barefoot walking in two examples of these footwear styles. Data collected on the FitFlop and a flip-flop have also been compared to determine whether the design choices evident in FitFlop pose advantages in terms of reducing gait modifications, if they are apparent in this footwear style.

The study has two aims, which are now defined in the introduction (Background, Para 5, The current research.....). These are to compare barefoot walking to walking in flip-flop style footwear. And to compare FitFlop footwear to flip-flop walking to see if it offers a potential advantage in terms of gait modifications. The results and discussion sections have been re-addressed to better focus to these aims, specifically the introductory sentence in the discussion (Discussion, Para 1, The study has…) and the data presented in the sub-sections in the results, as already stated, now matches the hypothesis. The wording has been altered in the discussion in parts to compare barefoot to flip-flop style footwear and thus encompassing the two shod conditions.

3. The finding that the FitFlop reduces rearfoot movement is interpreted as positive because of a possible association with reduced injury risk. However, this observation is contrary to the marketed aim of the FitFlop to provide ‘a soft midsole to induce instability’, as described in the introduction. This point cannot be ignored.
Response: This is likely to have come from the upper of the FitFlop condition and also the greater medial surface area that has been reported in previous papers (Price et al. 2013). The midsole is combined of three sections which can induce instability but the instability is not only in the coronal plane but also the sagittal plane. Furthermore, the midsole whilst it is marketed as inducing instability, these are minor perturbations rather than large ones as seen in other unstable shoes such as MBT.

Specific Abstract
4. I am not sure that all readers of the abstract will know what a FitFlop is. Some detail / description is required. Readers from different countries will also not know what a flip-flop is.
Response: Not defining flip-flops in the abstract is consistent with two other publications in the same journal (Chard et al., 2013; Zhang et al., 2013). However, we have defined the flip-flop and FitFlop with additional sentences in the start of the abstract.

5. The background detail suggests that a flip-flop and FitFlop are compared, but the results also mention barefoot. Please be consistent within the abstract.
Response: The abstract has been re-worded to match the aims now defined in the background of the study. The results in the abstract have also been re-structured to compare flip-flop/FitFlop to barefoot and then to each other to be consistent with the aims of the paper and clearer (Abstract lines 20-24).

6. The end of the methods section suggests two conditions, but there appear to be three. 
Response: this was an error and this section has been re-worded.

7. The eversion angle provided for flip-flop is negative and barefoot is positive, when both are stated to be increases in eversion compared with FitFlop. I imagine both should have the same sign?
Response: in the original version of the manuscript, both numbers included a -: one was on the line prior to the number so may have been missed.

8. Is the reduction in loading rate for FitFlop a comparison with the flip-flop (as the text suggests), or compared with barefoot?
Response: This is, as the text suggest, a reduction compared to the flip-flop condition, please see the main results section where a mean 5 BW\cdot s^{-1} reduction is reported in FitFlop compared to barefoot.

Response: thank you, this type error has been corrected.

Background
Para 1
10. The description of the features of a typical ‘flip-flop’ style shoe provided here (thin sole, no arch support, no heel-toe pitch) appear comparable to several features of a typical minimal shoe currently popular with runners. Are these specific features therefore really currently considered to ‘break recommendations for footwear’?
Response: “walking” has been added and the language mediated to refer to footwear design as opposed to footwear recommendations (Background, Paragraph 1, Flip-flops differ from standard....).

Para 2, final argument
11. I think this argument is not sufficiently clear. I imagine there a numerous models of flip-flop available on the market with different features in terms of the comfort, midsole material properties etc. Considering ‘flip-flop’ as one condition and comparing to something that essentially is also a flip-flop is not currently justified by the argument presented. What exactly do you mean by ‘bench-marking’ in this sense? As performed, it looks like the study uses barefoot as the control condition and compares the other footwear types to this. Surely a systematic variation of the properties of a flip-flop style shoe would be the best way forward for understanding how best to develop an appropriate shoe of this type?
Response: The aims of the paper have been altered in the introduction and in the first paragraph of the discussion. We appreciate your comment that systematic variation of a dependent variable increases the understanding gained when the independent variables alter. However, comparing two commercially available items of footwear has external validity as opposed to constructing custom-made items which cannot be directly applied to the retail environment and worn by consumers. We have re-structured this paragraph of the introduction to be two paragraphs, one defining the descriptive studies of flip-flop walking and one the more specific results to potential detrimental gait characteristics in this footwear style. We hope this makes a clearer argument. The sentence which ended the paragraph has also been replaced with one which identifies a replacement as valuable, thus reducing the emphasis on footwear design, which as identified, implies there should be some systematic variation in footwear design features (Background, Para 3, Describing gait.....)

Para 3
12. Are all of the gait modifications highlighted in the previous paragraph necessarily negative? Why is barefoot gait considered to be the best?
Response:
The gait modifications within this research have been selected and discussed as they are related clinicians concerns of the footwear. Clinicians also compare to barefoot gait generally and therefore this has been utilised as the baseline gait for comparison to the flip-flop style conditions in this paper and also to enable the data to be compared to other similar papers. We appreciate that barefoot gait is not necessarily optimal, however it does provide a comparator condition. Some of the language in the paper has been mediated to refer to “potentially detrimental” features (e.g. Background, Para 3; Background Para 1). The conclusions to the study also highlight that longitudinal research is required to determine if these changes are beneficial.

13. Study aim – is the aim to compare barefoot and flip-flop with FitFlop, but not be compare barefoot with flip-flop (as suggested in the stated aim). The hypotheses are not consistent with this aim. (the start of the discussion section seems to highlight another different aim).
Response: The aim of the study has been made clear and is now consistent throughout the text e.g (abstract Line 7-10; Discussion Para 1). The results and discussion presented now also consistently presents and discusses data with references to these aims. Therefore some data has been removed from the results and discussion sections since the first submission.

14. Hypothesis 1: the literature presented in the background section [8] suggest an increase in swing plantar-flexion, so how is an expectation of increased dorsi-flexion justified?
Response: A further reference and statement relating to research by Chard et al., has been included who compared flip-flop walking to barefoot and identified increased dorsiflexion Background, Para 2, Contrasting these…). Similarly a further sentence has been added to clarify why the directional hypothesis given for loading rates also differs with the literature presented in the introduction (Background Para 5, Thirdly, shod conditions…).

15. Hypothesis 2: it does not make sense to hypothesise that there will be lower frontal plane movement for the FitFlop compared with barefoot as a result of the ‘thicker strap’, as there is no strap for the barefoot condition.
Response: This hypothesis has been re-written such that the language is not comparative (Background, Para 5, Secondly, there is…..)

Methods
Para 1
16. I suggest describing the participants as being university students (or other), rather than being from ‘the University’. Or perhaps just name the University.
Response: we have added that the participants were “staff and students” to this section (Methods, Para 1, recruited from…..).

17. Footwear Conditions: in what way did the FitFlop vary between genders? The figure provided suggests they are very different.
Response: The methodology now includes a section describing what differs (and what is consistent) between conditions for the male and female study participants (Methods, Para 2, The FitFlop varied…..)

18. Protocol: once a self-selected speed was performed, was this then controlled for individual participants?
Response: the speed was allowed to vary between conditions (but didn’t), a sentence to clarify this has been added to the methods section (Methods, Para 3, Protocol, for each condition…..).

Kinematics and kinetics (Page 7)
19. You have not hypothesised anything with regard to joint moments, so it is not clear why these are being calculated?
Response: The frontal plane joint moments are included due to their relationship with the frontal plane joint angles. Similarly the muscle activation of lower limb muscles associated with the frontal plane motion at the ankle in stance are within this section in the results. The sagittal plane joint moments that were included in the original submission have been removed.

20. What are ‘variable magnitudes’?
Response: This meant the “magnitude of the variables” (as opposed to the time) but was obviously unclear and has been re-worded (Methods, Para 5, Peak values and magnitudes….).

Results
21. Many more variables are presented in the results section than are justified in the background section or included in the hypotheses. Please justify.
Response: The sagittal plane joint moments have been removed from the text and figures and also the gastrocnemius and soleus activation in stance as they do not relate specifically addressed in the hypothesis of the study. The abstract and methodology sections have been altered accordingly. Related data such as vertical heel velocity for loading rates is included in the results as this relates to the loading rate variables, similarly the frontal plane joint angles are further explored with reference to the frontal plane joint moments.

Ankle angle swing
22. It is stated that ankle plantar- and dorsi-flexion differ between conditions – between which conditions and in what direction?
Response: as recommended, a statement identifying the changes has been added (Results, Para 1, Ankle joint angles….).

23. Under the title of ‘ankle angle swing’, ground contact moments are also presented – please justify or change section heading.
Response: The sagittal plane moments from the results section have been removed in-line with the comments above. They have also been removed from Figure 2.

Discussion
Para 1
24. The start of this paragraph suggests that the main focus of the study is to compare the flip-flop with barefoot and with the FitFlop. This does not seem to be the case throughout the manuscript. Even the final sentence of this paragraph suggests the aim has been to compare both footwear types with barefoot. Consistency in the study aim is required.
Response: Please see above: the study aim is defined and this section has been altered accordingly.

Ankle angle swing
25. You have not hypothesised anything about ankle angle at heel strike or toe-off.
Response: the statement within the hypothesis has been re-worded to refer to alterations in joint angle at heel-strike (Background, Para 5). Additionally, Chard et al., data added has been added to introduction where their results identified greater dorsiflexion at heel-strike.

Frontal plane ankle
26. Please elaborate regarding why a reduction of around 1 degree in peak eversion may be potentially beneficial. The 4 degrees of reafoot eversion observed for the barefoot and the flip-flop cannot be considered ‘excessive’, so why would a reduction in this be desirable. You could argue the opposite?
Response: It has been shown in many studies that orthoses reduce ankle eversion by around 1 degree and upwards (Lui et al. 2012). In individuals who have excessive eversion, if the FitFlop reduces eversion (as seen in this study) this can be seen as a beneficial outcome as Barton et al.2011 described that response to orthoses were better in individuals with greater peak eversion angles. However, this would need to be confirmed in a clinical study. The requirement for further research is
highlighted at the end of the conclusion where the reduction magnitudes are referred to (Conclusion, Para 1, However it is not clear......).

27. Did you consider looking at gender differences, as you have 20 of each?
Response: due to the differences in the footwear we decided not to consider gender differences or interactions as we could not isolate these to specific gender or footwear influences. We recognise that this is a limitation of the current comparison (Discussion, Para 4, Gender differences have.....) and should be compared in future work. However, due to the differences in footwe ar style, it is difficult to isolate a ‘gender’ interaction as opposed to a ‘gender/footwear style’ interaction and therefore discussion and comparison to existing literature considering gender differences is limited. Consistent with your other recommendation, we have further defined the differences between the male and female to aide readers interpretation of the study findings.

Loading rate
28. I am not clear how results of a study comparing heel velocity for flip-flops and trainers can be compared with results of a study of flip-flops and barefoot.
Response: This section has been re-worded, the point we were trying to make is that the heel velocities in this studies were consistent with previous studies available in the literature in similar footwear. Therefore the comparison shoe is irrelevant so the specific section of the statement relating to this has been removed (Discussion, Para 6, Velocity of the heel towards......).

Conclusions
29. Does your study demonstrate that ‘gait modifications’ are reduced for the FitFlop compared with the flip-flop? When both footwear conditions are compared with barefoot, the flipflop is closer to barefoot, suggesting that the flip-flop demonstrates reduced gait modifications.
Response: We appreciate your point: the standard flip-flop data more closely resembles the barefoot data in this study. We have re-worded the conclusions section to remove the reference to reduce gait modification”.

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.