Author’s response to reviews

Title: Three-dimensional foot shape analysis in children: a pilot analysis using three-dimensional shape descriptors

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Journal of Foot and Ankle Research JFAR-D-19-00168

Title: Three-dimensional foot shape analysis in children: a pilot analysis using three-dimensional shape descriptors

Editor

Your manuscript "Three-dimensional foot shape analysis in children: a pilot analysis using three-dimensional shape descriptors" (JFAR-D-19-00168) has been assessed by our reviewers. Although it is of interest, we are unable to consider it for publication in its current form. The reviewers have raised a number of points which we believe would improve the manuscript and may allow a revised version to be published in Journal of Foot and Ankle Research.

Their reports, together with any other comments, are below. Please also take a moment to check our website at https://www.editorialmanager.com/jfar/ for any additional comments that were saved as attachments.

If you are able to fully address these points, we would encourage you to submit a revised manuscript to Journal of Foot and Ankle Research. The due date for submitting the revised version of your article is 24 Dec 2019. I look forward to receiving your revised manuscript soon.
We appreciate the helpful and constructive feedback and thank-you for giving us the opportunity to submit a revised version. Below we provide a point-by-point reply to each and every comment. After addressing the reviewers’ comments and incorporating some changes into the manuscript, we highlighted (yellow) the changes to the original submission.

As a consequence of the thorough review process, we hope that the paper is now in an acceptable form for publication in the Journal of Foot and Ankle Research. We remain open to any further feedback and suggestions to improve the paper.

Reviewer #1

Below, the comments of Reviewer 1 are listed, and it is described how they have been incorporated into the revised paper.

This is an interesting and well-conducted study which seeks to quantify changes in foot shape with advancing age using 3D scanning technology and morphological analysis. Due to the small sample size, the results are very preliminary and at this stage in the research process, have limited application to clinical practice. However, the findings may be of interest to more research-focused readers of JFAR. To warrant publication, the authors will need to work on their justification for the study, and spend a bit more time defining the variables they have used and what they actually mean.

[Reply] Thank you for the evaluation of our manuscript. We are happy you appreciate the idea and implementation of the study and we understand that it needs further work on the justification for the study and the clarification of the terms.

We tried to carefully consider all your notes and suggestions for improvements so that the thoroughly reviewed manuscript will hopefully be accepted for publication in the Journal of Foot and Ankle Research.

Abstract

1. The background section does not provide a strong justification for the study, and there's no real sense as to why 3D measurement is necessary. There's lots of potential arguments that could be made to justify the study (better accuracy, resolution, complexity, etc), but the authors need to clearly state what they are.

[Reply] We agree and changed the text to provide a clearer justification for the study.
2. Methods section: the authors need to define some of the key measures (e.g. shape-index, curvedness), as these are not intuitive.

[Reply] We agree with your comment, the full definitions are included in the article and, due to a limited word count, we have opted not to repeat these in the abstract.

3. Results section: this is very difficult to follow, as the phrases used ("increase in lower curvedness", "increase in concave areas", "medium curvedness extended", "concave areas increasing") can't be easily understood by anyone unless they have read the whole paper. Also, where directional words such as 'increased' are used, the authors need to make it clear what the reference category is. I assume this means an increase across the 3 ascending age categories, but this isn't immediately apparent.

[Reply] Upon further reading of the section we have changed the text accordingly throughout the paper:
- References to the increasing age have been included.
- Concavity\concave replaced with indented
- Convex replace by protruding
- Curved replaced by rounded

4. Conclusion section: also a bit difficult to follow. A more general comment like "With increased age, the foot becomes longer and thinner and the medial arch increases in area and concavity" would summarise the findings more clearly.

[Reply] We have modified the text accordingly.

Background

5. Line 70: define "shape index".

[Reply] We have defined this.
6. Line 76: define "hyperbolic areas".

[Reply] We have removed it to reduce complexity.

7. Line 85: why "in a small sample"? Presumably the authors are collecting data on a larger sample? If so, the authors need to state what the purpose of the pilot study is - to test feasibility, select candidate measures for the larger study, etc.

[Reply] We have added a sentence to explain the purpose of this study and removed the words "small sample" from the section, we hope this offers further clarity.

Methods

8. Line 102-112: please provide more detail regarding the scanner, including the actual technology (structured light, laser), spatial resolution, etc., and some justification as to why this was selected from the very wide range of scanning options available.

[Reply] We have added the justification for scanner choice.

9. Lines 102-112: have the authors performed any test-retest reliability on the scanner? Given the age of the participants and the use of a hand-held scanner, presumably there is some room for inaccuracy between repeated tests?

[Reply] We previously undertook some reliability analysis and have added this data into the “3D shape descriptor calculation” section

10. Lines 128-134: the shape index descriptors would be easier to understand if example images were added to Table 1.

[Reply] A reprint permission order has been granted to reuse Figure 5. from Koenderink and van Doorn (1), which is used as a standalone figure (Figure 1) to give a clear idea about the different shapes that are represented by the ranges in Table 1.
Results

11. Line 162: would be useful to restate that the groups relate to increasing age categories.

[Reply] We agree and restated it.

Discussion

12. Line 239: need to add "of three different age groups" somewhere here.

[Reply] We agree and added at the end of the first sentence.

13. Line 243 and 268: I don't think the subheadings are necessary.

14. Line 245: the statement "the overall shape of the foot becomes less curved with age" seems to be too broad a conclusion and may confuse some readers (particularly as many will consider the medial longitudinal arch a "curve"). Although I appreciate that this is true overall, there is an increase in curvedness around bony landmarks (which is mentioned later in the paragraph). Some rewording of this section so "curvedness" is only used in relation to particular regions/landmarks of the foot might be helpful.

[Reply] We agree and changed “less curved” to “less rounded” and changed the sentence to exclude the plantar surface and the anatomical landmarks from this statement.

15. Line 281-282: These data.

[Reply] We corrected this error.

16. Lines 285-286: although I broadly agree with the sentiment here, I'm not convinced that the findings make a strong case for uptake of this approach in clinical practice (at least not yet). Rather, I think this work sits more at the basic science end of the spectrum, as whether foot surface shape is actually important in relation to how the foot functions dynamically, whether it influences selection of treatment, and whether changing shape is therapeutically beneficial is not yet known. I suggest toning this down a little more.
Upon revisiting the significance and phase of our research, we have expanded this section. Currently 2D measures are used in clinical practice to support the assessment, however these measures are low in resolution and do not capture the actual shape of the foot. We think that, although further work is needed, there is a strong relevance to clinical applications through the ability of objective and accurate quantification of foot shape at high resolution, capturing morphological changes during foot development or clinical treatment. An example of using 3D shape in clinical application can be found in (2), where the authors showed a link between ankle shape and history of injury as well as race. Although they used radiography, a similar approach can be applied to 3D scan data using 3D shape descriptors without the harmful effects of radiography. Stankovic, Booth (3) have also argued how their approach to 3D shape analysis (geometric morphometrics) of the foot could aid in standardizing and automating clinical assessments e.g. exploring the relationships between different foot parts.

17. Line 301: the addition of a final "future research" paragraph would be helpful so the readers can understand where the authors are heading with this work.

[Reply] We agree and added some further information about this.

References

18. Please check your referencing accuracy - there's a few errors (eg. missing volume or page numbers, some journal titles not abbreviated, ref #6 has "0" as its volume, etc).

[Reply] Thank you for identifying these errors, we corrected them.

Reviewer #2

Thank you for the opportunity to review this article. The use of scanning technology could provide some exciting insight into paediatric development when used on an appropriate sample and this study gives some insight into processes and expectations for other researchers and for this study team. The article was well written and achieved what it set out to do in a clear, easily understood manner.

I will include my comments below via ln reference.

[Reply] Thank you for the evaluation of our manuscript. We are happy you appreciate the idea and implementation of the study. We tried to carefully consider all your notes and suggestions for improvements.
References

