Reviewer’s report

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

Version: 0 Date: 29 Oct 2019

Reviewer: Hylton Menz

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JFAR review: Three dimensional foot shape analysis

General comments

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.

Specific comments

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.

2. Methods section: the authors need to define some of the key measures (eg. shape-index, curvedness), as these are not intuitive.
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.

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.

Background

5. Line 70: define "shape index".

6. Line 76: define "hyperbolic areas".

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.

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.

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

Results

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

Discussion

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

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.

15. Line 281-282: These data.

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.

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.
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).

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