Reviewer's report

Title: Reliability of capturing foot parameters using 3D non-contact digitisation and the neutral suspension casting technique

Version: 1 Date: 17 August 2010

Reviewer: George S Murley

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Title: Reliability of capturing foot parameters using 3D non-contact digitisation and the neutral suspension casting technique
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This study compared the reliability of capturing specific foot anthropometric characteristics from a 3D scan and a neutral plaster cast impression. This investigation is of interest to podiatrists who cast patients' feet for customised foot orthoses.

1. Is the question posed by the authors new and well defined?
   Yes

2. Are the methods appropriate and well described, and are sufficient details provided to replicate the work?
   No

3. Are the data sound and well controlled?
   Partially

4. Does the manuscript adhere to the relevant standards for reporting and data deposition?
   Partially

5. Are the discussion and conclusions well balanced and adequately supported by the data?
   Partially

6. Do the title and abstract accurately convey what has been found?
   Yes

7. Is the writing acceptable?
   Partially
MAJOR COMPULSORY REVISIONS
(which the author must respond to before a decision on publication can be reached)

Abstract:
1. The reliability results of the plaster cast technique are not reported in the results or conclusion of the abstract

Introduction:
2. Page 3 – 1st paragraph. The wording ‘…obtain a reproduction of the foot’ is awkward and is used a few times in the introduction. Consider changing to ‘…obtain an accurate impression of the foot’

3. Page 4 – 4th paragraph. The results of previous studies have been listed without any critical appraisal or discussion, and therefore, it is unclear what issues/arguments the authors are raising in this section. In addition, why have the authors included some reliability outcome measures for some studies and not others?

4. Page 4 – 4th paragraph. All references in this paragraph are from multiple authors and are therefore not cited appropriately in-text. This issue is evident throughout the manuscript

5. Page 4 – 4th paragraph. Line 2 – what are ‘within-method’ techniques?

Methods section:
6. The methods section would be enhanced by pictures and or diagrams of the equipment/casting procedures

7. Page 5 – Participants. Why did the authors decide to exclude participants with all of these conditions? This reduces the generalisability of the results to a large portion of patients who require casting/customised foot orthoses therapy

8. Page 5 – 3rd paragraph. Since this paper is focused on the plaster cast and 3D digitisation methods, it is inadequate to have one sentence describing the plaster cast technique

9. Page 5 – 2nd paragraph. The 3D non-contact digitiser that used triangulation by pattern projection is not shown or illustrated in Figure 1

10. Page 6 – 1st paragraph. The second sentence states that 6 plaster casts were taken of the left foot and then the following sentence states three casts were taken of each foot

11. Page 6 – 1st paragraph. Did any rater training take place to reach consensus on the casting/scanning technique? Was rater 1 blinded from rater 2 during the casting/scanning procedure? Was the foot re-positioned by each rater following each digital scan? Perhaps not if only 20 seconds separated each scan. This is
an important issue that may affect the generalisability of the reliability findings. That is, does the inexperienced rater depend on the experienced rater to place the foot accurately for the scanning procedure?

12. Page 6/7 – The description of cast length seems more like cast width

13. Page 6/7 – The description and associated figure (1) for the foot parameter measurements could be made clearer by adding further detail to figure 1. For example, how was the calcaneus bisected? What is meant by ‘widths were taken at 10mm heights on the cast/scan? How were measurements, such as the navicular tuberosity, determined on the 3D scan?

14. Page 7 – Statistical analysis. Could the authors please clarify in the manuscript whether; (i) the data was screened for normality, and (ii) whether hypothesis testing was undertaken to determine whether systematic bias was statistically significant.

Results section:

16. Page 8. ‘The results demonstrated a mean a age’. This should be re-worded as the participants’ anthropometric characteristics are not the result of the experiment.

17. Page 8 – 3rd paragraph. What is meant by ‘…least supportive reliability findings’?

18. The results section is disorganised. In the second paragraph, the reliability of some measurements are included while others are not. For the 3D digitisation method, the authors report the ICC range for all measurements and the SEM for each rater individually. However, for the plaster cast method, the ICC results for the forefoot to rearfoot alignment and medial arch height are reported, but not the SEM or the other foot measurement?

Discussion:

19. Page 9 – ‘The Virtual OrthoticsTM digitiser utilised in our study allowed…’. The manufactures name should be replaced with 3D digitiser to be consistent with other sections of the manuscript.

20. Page 9 – final sentence. Without a diagram or further explanation, it is unclear what meant by ‘This resulted in the heel being further from the scanning bed than the forefoot that may have contributed to an increased measurement error’.

21. Page 10 – The following sentence requires revision, as it sounds as though the testers foot was more inverted forefoot. ‘When casting with the neutral suspension technique our results indicated rater 1 (inexperienced rater) had on average a more inverted forefoot to rearfoot alignment’.

22. Page 11 – The following sentence does not make sense to the reader:
‘Adhering to the foot morphology theory [14] prescription protocol begins with a cast of the foot in a non-weightbearing neutral position’

23. Page 11 – 2nd paragraph. The following sentence in confusing and potentially contradictory to the previous sentence… ‘In the study only pes cavus feet were cast, whereas our methodology did not exclude specific foot types’

24. Page 11/12/13 – A large portion of the discussion contains describes different theories of foot function (i.e. sagittal plane facilitation theory, tissue stress paradigm). However, it is unclear what the relevance this has to the reliability of the two casting techniques.

Tables 1:
25. A table caption is needed to explain the meaning of the numbers listed in columns 1, 2 and 3 (presumably average measurements?)

26. The lower limit of the ICC 95% CI for rater 1 is three decimal places

Figures:
27. Figures 2-5: Why are there only figures for four of the six foot parameter measurements investigated?

28. Figures 2-5: What is the purpose of including the Bland and Altman plots. There are not referred to in the paper (i.e. there are no comments in the paper indicating what the plots illustrate in terms of the results)

29. Why have the authors chosen to illustrate inter-tester data in the Bland and Altman plots rather than both inter- and intra-tester reliability.

Conflict of Interest Declaration:
30. Upon reading this manuscript, it appeared that Virtual Orthotics supported this study as a commercial partner. As Phillip Hartshorne (Director of Virtual Orthotics) has been listed as a co-investigator of this study on the AUT University website (www.aut.ac.nz/research/research-institutes/hrrc/research-activities/podiatry), could the authors clarify whether there was potential for any Conflict of Interest in the preparation of this manuscript. Perhaps a short statement around this issue could be added to the Conflict of Interest Declaration.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Not suitable for publication unless extensively edited

**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'