Author's response to reviews

Title: Reliability of two goniometric methods of measuring active inversion and eversion range of motion at the ankle

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Author's response to reviews: see over
Dear Editor,

We wish to thank the reviewers for their thoughtful consideration of our manuscript. We have addressed each of the reviewer’s comments. Responses to these comments are contained in this letter and the manuscript has been revised accordingly.

The formatting issues raised by the editorial staff (ie. competing interests and acknowledgements) did not require any changes to our manuscript.

Yours sincerely,

Kathryn Refshauge
Reviewer 1

1. The authors make many claims that are not sufficiently supported. We have analysed the data using ANOVA. We now therefore provide evidence to support our claims. I strongly suggest that the authors reanalyse their data using generalizability theory.

We have not used generalizability theory because ICCs are currently more commonly used in most countries and can therefore be used for comparison amongst studies. We did not design the study *a priori* to use generalizability theory, such as accounting for different range of motion with the different measurement protocols. This approach, particularly implemented post hoc, is thus inappropriate for our study.

2. The authors have studied 60 ankles of 30 subjects. Clearly the data on the left and right ankle are not independent.

As previously stated, generalizability theory is inappropriate at this stage of analysis. However, one third of participants had a unilateral injury or bilateral injuries of various types, and therefore range of motion is likely to be independent in these participants. For healthy control participants, range of motion is unlikely to be independent, but measurement of right and left feet may well be independent, eg, depending on hand dominance of the observer.

3. The authors conclude that experience and training do not confer greater consistency of measurement.

This claim is supported by overlapping confidence intervals for all measurements. *Only three raters were included in the study.*

This is true, and so we have now softened our claims about relevance of experience and training.

4. For Fastrak: The authors claim that in the sitting position the correlations were higher than in the prone position….more closely replicate the actual range of motion.

We have now clarified in the text that the goniometric measurements do not replicate the Fastrak measurements, but instead are closely related.
Reviewer 2

INTRODUCTION

The Introduction should be called Introduction and not Background.

We have renamed Introduction

The controversy is not well stated. In other words, why is it necessary to perform this study?

The introduction justifies the rationale for the study by emphasising the lack of information about the reliability of measuring active inversion and eversion at the ankle. There is actually little controversy in this area, because very little work has been conducted. The one study which has evaluated the reliability of active inversion (but not eversion) has some design flaws, which we have identified, thus supporting the need for a more full and rigorous evaluation.

Page 3, line 8. Why should objective measurements like goniometers be used instead of for instance scores?

We are not sure what the reviewer is referring to here. If the reviewer is referring to self-reported function, such as the Lower Extremity Functional Scale, these scales often have a ceiling effect with injuries such as ankle sprain. They are also not expected to change immediately with treatment. It is essential, therefore, to measure some impairments, and range of motion is one such impairment that is commonly measured in clinical practice.

Page 3, line 16. Please use the word 'observer' instead of 'assessor'

We have changed ‘assessor’ to ‘observer’ throughout the manuscript

The aims of the study are a bit vague. Please re-consider:

We have now clarified the aims (p.4)

METHODS

Can the Methods section be shortened to make it more straightforward and easier to follow?

We do not believe we can remove any of the information presented. We have provided sufficient detail for this experiment to be replicated by others, while maintaining brevity with concise reporting. We believe removal of any information would affect the ability of the reader to replicate the methodology. Given the electronic nature of the journal, we do not believe this is an issue. However, we would be pleased to be guided by the editor in this matter.

Page 4, last 2 lines and page 5, first line. In my opinion, patients with diagnoses such as plantar fasciitis........should have been excluded

We are not sure why these patients should have been excluded. By including a large diversity of injuries, we have increased the generalisability of our findings. We believe this is a strength of the study.

How were the 3 observers chosen and why?

The three observers were chosen on the basis of experience, including a very experienced and an inexperienced physiotherapist, and an exercise scientist. We believe this is clearly described on p.5 of the manuscript. By selecting observers with different levels of experience, we were able to evaluate the effect of experience on reliability of these measurements.

The two test positions are well described

• No comment required
The comparison to a reference standard is important

- No comment required

Use of stress radiographs as a gold standard

It is difficult to argue that stress radiographs (a 2-D static measure) provide a better reference standard than measurements made with the Fastrak (a 3-D dynamic measure). In addition, stress radiographs are taken in a very different position from the positions in which we measured ROM.

Data analysis is well done

We are unsure whether the scientific editor expected us to give more weight to the comments on data analysis from Reviewer 1 or 2. However, we have completed further analysis on the basis of comments of Reviewer 1.

RESULTS

Can the results section be shortened, reporting only the most important results in the text and the rest in tables?

We have shortened the Results section, and reported on only the most important results in the text.

We have also re-structured the Results so that we refer to the tables in the correct order.

DISCUSSION

First of all, the Discussion should start with a short sentence....

We have amended the Discussion accordingly.

Secondly an important question is whether the eversion measurements are of little or no value in the clinical setting.

We believe it is premature to discard eversion measurements. Reliability of measuring eversion is not as high as measuring inversion. The most common use of eversion is by a single rater between measurement sessions, and the ICCs range between 0.54 to 0.6 in the prone position, ie the reliability is moderate rather than poor.

Sources of measurement error are well described, and as in every study an important part of the manuscript.

- No comment required

Discussion about a gold standard such as stress X-rays should be added.

We have chosen not to include a discussion about the use of stress x-ray because it is not really a gold standard (see comment above).
What about the effect of gender?

We did not believe gender would provide useful information in this context. We do not have easy access to gender of participants at this stage, because this information was not recorded, and therefore are unable to evaluate this issue.

What about the effect of foot/ankle size?

We did not measure foot/ankle size and therefore cannot attend to this comment. In addition, we would have needed a far greater number of participants to answer all such questions.

Please elaborate on the clinical implications. In other words, are goniometers useful or not?

We have added a comment to the effect that goniometers are definitely useful, but clinicians should select position and measurement method carefully.

CONCLUSIONS

The Conclusion section should be shortened....contain only 1-2 sentences, giving the important results only. Clinical perspectives should be in the Discussion section.

The Conclusions have been shortened and clinical implications removed.

ABSTRACT

The abstract is structured and describes the most important results very well. It is well written and flows well.

- No comment required.

Please do not use references in the Abstract

References have been removed.

Please add a few words about the clinical relevance.

We have added a statement concerning clinical relevance.

The keywords were missing in the copy sent to this reviewer

Keywords added.

TITLE

The title is appropriate

- No comment required.

FIGURES

All 3 figures are good and should be kept

- No comment required.

REFERENCES

References are in good order

- No comment required.

TABLES

All tables are in good order and should be kept.

- No comment required.