Author’s response to reviews

Title: Reliability of analysis of the bone mineral density of the second and fifth metatarsals using dual-energy x-ray absorptiometry (DXA)

Authors:

N. Pritchard (pritchardns@gmail.com)
James Smoliga (jsmoliga@highpoint.edu)
Anh-Dung Nguyen (anguyen@highpoint.edu)
Micah Branscomb (bransm13@highpoint.edu)
David Sinacore (sinacored@wustl.edu)
Jeffrey Taylor (jtaylor@highpoint.edu)
Kevin Ford (kford@highpoint.edu)

Version: 1 Date: 01 Nov 2017

Author’s response to reviews:

JFAR-D-17-00089

Dear Catherine Bowen

Journal of Foot and Ankle Research

Thank you for the detailed review and recommendations to improve our manuscript. We have addressed each item below in a point-by-point response. We feel these changes improve the manuscript and we greatly appreciate the detailed reviews below.

Reviewer reports:

Reviewer #1: Thank you for submitting an interesting piece of work. Overall, this is a well written piece of work with good scientific rationale and clear description of aims and methodology that would be of value to this field of work.
Thank you for your review, comments and interest in our paper. The authors have revised the manuscript based on your feedback.

Abstract:
It may be of relevance to add a single sentence into the discussion section to highlight the varying ICC (particularly the poor ICC for scan-rescan) and what this means for the interpretation of your study; suggest removal of 1st sentence in this section to enable word count fit.

The authors agree and added the following as suggested: “However, inter-rater reliability and scan-rescan reliability for the distal regions were poor.”

Background:
This is well written and appropriately referenced throughout. Sufficient information is given to establish the rationale for the work presented. The overall aim/purpose is clearly stated.

Methods:
Please provide a rationale for your sample size.

The authors agree and added the following as suggested and cited the source “Sample size was based on the international society for clinical densitometry’s recommendations for precision assessments”.

Reference to participant consent and ethical approval is appropriately included.

Please clarify the process for inter-rater image scoring with regards to image capture; were these captured once and then the image analysis repeated or was the whole process of positioning the participant, taking the scan and image analysis repeated? If not the latter please make reference to this also in your discussion. It seems that this may have been the case for intra-rater testing but not inter-rater testing?

Identical scans were analyzed for intra-rater and interrater reliability, whilst two different scans, where the whole process was repeated, were analyzed for scan-rescan reliability.
Appropriate analysis techniques are reported.

Results:

These are clearly presented.

Discussion:

Please consider the potential for error that may result from differing foot placement on the scanner bed and this was overcome within your protocol. This is of particular relevance given the poor scan-rescan ICC for the distal segments of the 2MT and 5MT.

Line 182-184: 'through training it is possible...'; please provide a reference for this statement.

The author’s agree and the citation Deriaz et al. was added. The foot was placed in the center of the mat, which was placed in the center of the bed, each time. However,

The sentence, “Standardizing the sagittal plane orientation of the ankle may help improve the reliability of these measures” was also added to consider the potential for error on foot positioning on the reliability measures.

Conclusion:

This is fair however please do consider adding the caveat that scan-rescan may not be as good and this has clinical implications when considering repeated use over time to assess change in a single patient.

Tables: These are clearly presented.

Reviewer #2: The paper is concisely written and explores the reliability of scoring DXA scans of the 2nd and 5th metatarsal shafts in recreationally active individuals. The conclusion that the method used is reliable indicates that the methods descriptions within the paper will support researchers in the future who wish to determine the risk of metatarsal fracture in different populations. There are a number of comments and questions that I have related to the readability of the paper for readers of the Journal of Foot and Ankle Research.
Thank you for your detailed review, comments and interest in our paper. The authors have revised the manuscript based on your feedback.

Title: As it stands this does not make sense. Are there words missing? I suggest rewording the title to reflect the aim of the study (to reliably score of the regions of interest in the 2MT and 5MT). For example:

"Reliability of analysis of the bone mineral density of the second and fifth metatarsals using duel energy x-ray absorptiometry".

(Please note that any changes to title must be changed in BOTH the manuscript file and the relevant section in the online submission system).

The authors agree and made the following change to the title: Reliability of analysis of the bone mineral density of the second and fifth metatarsals using dual-energy x-ray absorptiometry (DXA).

Abstract: The results section would benefit from some figures being added. If word count is an issue, then I suggest shortening the background section in favour of more information in the results.

The authors recommend not adding figures to the abstract in order to keep the figures within the main text of the manuscript but would be happy to defer to the editor on her recommendation.

Please also note that JFAR headings in the abstract should be Background, Methods, Results, Conclusion. Therefore, please rephrase the discussion section.

The Authors have removed DISCUSSION and have the correct headings of Background, Methods, Results, Conclusions.

Background, line 63-64: The statement 'as a result, athletes may be forced to miss half, … etc" requires a supportive reference.

The authors agree and have referenced Jain et al. which show a mean time loss after 5th metatarsal fracture of 68.3 days.
Background, line 75: ROI is used for the first time and requires being written in full. This then can be altered on line 104 in the following page.

The authors agree (nice catch!) and have made the requested edits.

Materials and Methods, line 81: Please change to JFAR heading of Methods

The authors changed the heading.

Methods, line 82: please add the number as well as percentage of men. Note that male is an adjective and that male and female should only be used as descriptors. For example, use male/female participants or men/women.

The authors agree and added specific male/female participants.

Methods, line 91: please clarify the protocol. Did you scan the left foot only for all participants? If yes, why was the left foot selected and not the right foot?

Thank you noting this. We collected both left and right but intentionally only analyzed the left side for scan-rescan reliability as previous described by a similar manuscript (Fuller et al.). We have clarified the text: “While both left foot and right foot were collected as described below, only the left foot was chosen to analyze for scan-rescan reliability.”

Methods, line 93: "the technician's side of the with their feet" does not make sense. Please clarify.

The authors have clarified the text: “Subjects were instructed to sit upright with their feet flat and hip width apart.”

Methods, lines 91-97: I am not clear on how you ensured that the foot position was the same between each scan session? Please could you add more detail here to explain this.

The foot was placed in the center of the mat, which was placed in the center of the bed, each time. However, the sentence, “Standardizing the sagittal plane orientation of the ankle may help improve the reliability of these measures” was also added to consider the potential for error on foot positioning on the reliability measures.
Methods, line 96: please clarify "the vertical axis" .... Of what?

The authors agree and changed “the vertical axis”, to “the antero-posterior axis of the foot”.

Methods line 97: please clarify "the horizontal axis" … of what?

The authors agree and changed “the horizontal axis”, to “the medio-lateral axis of the foot”.

Methods, line 99: Why / how was a cloth placed under the lateral side of the foot? A picture may help explain this better.

The cloth was placed under the foot to better position the fifth metatarsal in the scan. This helped reduce any overlay of the fourth metatarsal head and shaft on the fifth metatarsal head and shaft in the image and helped improve the ease at which the analysis procedure could be performed. The authors added “A folded cloth was placed under the lateral side of the foot to optimally position the fourth and fifth metatarsals in the scanned image” to help clarify.

Methods, line 100: please explain who performed the scans? Were they performed by the investigators? Raters? Or an independent radiographer?

The authors added the sentence, “Raters were investigators who had previous experience in full body and metatarsal DXA scan procedures”, to explain the experience and relationship of the raters.

Methods, line 101: Please be more explicit in who the raters were. How were they trained and what level of experience did they have in analysing DXA scans?

The authors added the sentence, “Raters were investigators who had previous experience in full body and metatarsal DXA scan procedures”, to explain the experience and relationship of the raters.

Methods, lines 105-113: please can you elaborate on the approach taken to analysing the scans using the spine analysis software? Can you provide references to support this approach?
The authors agree and have added the references Bohnert et al. and Fuller et al. to support the selection of the spine analysis software.

Methods, line 112: The software was used to analyse Bone Mineral Content (BMC) as well as bone mineral density. This is the first time that readers have been introduced to the concept of analysing BMC. Please can you ensure that the relevance of this analysis is also explained and justified within the background and aims.

The authors agree and the sentence “The software was then able to calculate the bone mineral content (BMC), area for the proximal, shaft, and distal regions. The BMD was then calculated as the ratio of BMC to area in each region” was added to help clarify the relationship between BMD, BMC, and area.

Methods, line 119: please explain how randomisation took place.

The authors added the fragment” All analyses were performed in a randomized order via a random number generator,” to help explain further.

Results, line 147 - 148: there appears to be inconsistency in the numbers presented. Please check the figures and rewrite as in your previous sentences.

Thank you for catching this! The author's reviewed the tables and a change was made in the ICC and SEM ranges.

Discussion, line 152: As per the title, you may be overstating what you have done. Consider changing the sentence to state that your scoring of BMD was reliable.

The author’s agree and changed the sentence to “Our assessment of bone mineral density was reliable for the 2MT and 5MT total ROI’s”

Discussion, lines 190-198: Your conclusion nicely summarises your work therefore I am not sure what this paragraph adds to the discussion of your findings? It appears to take the reader along a tangent away from the work related to reliability of scoring. It is possible that you are attempting to emphasise why understanding of metatarsal BMD is important, however is this not part of your background section?
The author’s agree and have removed this paragraph from the manuscript.

Conclusion, line 201: in light of comments above please consider changing this to "In summary, a reliable technique for assessing bone mineral density of the shaft and sub-regions of the shaft of the second and fifth metatarsals was performed. This could be repeated in laboratories to screen…"

The authors agree and the sentence was changed per your recommendation.

Other comments:

Please provide a legend for the Tables to detail abbreviations used (eg 5th met, 2nd met, ICC, SEM.

The following footnote was added beneath each table to detail the abbreviations:” Fifth Metatarsal bone (5th Met), Second Metatarsal bone (2nd Met), Intra-class Correlation Coefficient (ICC), Standard Error of Measure (SEM)

Please provide a key for Figure 1 that details the ROIs.

The legend was updated to include a description of the ROI’s. The following text was added: “The outlined area within L2 was considered proximal. The outlined area within L3 was considered the shaft. The outlined area within L4 was considered distal.”

Please ensure that the square bracket references are inserted BEFORE punctuation with a space inserted before the preceding text, eg:

There have been several previous studies in this area [1, 2-5].

Corrected

Please avoid the use of "subjects" and use "participants" instead throughout the manuscript.

Corrected