

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Using the Oxford Foot Model to determine the association between objective measures of foot function and results of the AOFAS Ankle-Hindfoot Scale and the Foot Function Index - a prospective gait analysis study in Germany
AUTHORS	Kostuj, Tanja; Stief, Felix; Hartmann, Kirsten; Schaper, Katharina; Arabmotlagh, Mohammad; Baums, Mike; Meurer, Andrea; Krummenauer, Frank; Lieske, Sebastian

VERSION 1 – REVIEW

REVIEWER	Dr Andrew Buldt La Trobe University. Australia
REVIEW RETURNED	05-Dec-2017

GENERAL COMMENTS	<p>Thankyou for the opportunity to review this article. The authors have addressed an important and difficult aspect of gait related research in attempting to understand the association between subjective and objective measures. The article is well written and appropriate conclusions have been made. I would appreciate it if you could address some issues.</p> <p>- Can you please provide some more clarification and justification as to the selection of the kinematic measures that measured using the Oxford foot model. The model describes motion of the rearfoot and the forefoot. As the rearfoot includes both the talo-crural and subtalar joints, it is difficult to understand how variables that include the forefoot would describe sub-talar joint function. This is mainly because there are many other joints that may be contributing to the motion detected in the forefoot. The authors need to justify the use of forefoot related measures more clearly, or only use rearfoot measures.</p> <p>-There is some confusion as to whether you are describing foot dysfunction, or describing kinematic and kinetic variables that are not necessary dysfunctional but vary from normal. This needs to be made clear. If you are choosing to define the biomechanical measures as dysfunctional. Can you please provide some justification as to how you came to this classification.</p>
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REVIEWER	Julie Stebbins Oxford University Hospitals NHS Foundation Trust United Kingdom
REVIEW RETURNED	07-Dec-2017

<p>GENERAL COMMENTS</p>	<p>This paper assesses the correlation between an objective functional measure of foot and ankle biomechanics (The Oxford Foot Model - OFM) and patient/clinician reported rating scales. The paper is well written and easy to follow. It is helpful that effort has been made to try and assess the usefulness of the rating scales, as these are sometimes used without critically assessing them first. I have 3 main comments regarding the content of this manuscript, which would be helpful to have clarified.</p> <p>1. The aim of the paper is a little unclear. The title suggests the aim is to assess the validity of 2 different rating scales (by comparing the outcome to the OFM). While the stated aim in the introduction is to "determine the association between physical foot dysfunction using the OFM and perceived disability...". These are not exactly the same thing, and makes it difficult to determine exactly what the authors were aiming to achieve. Given the OFM measures something different to the rating scales, does correlation between the measures really reflect validation? It would help to clarify this.</p> <p>2. I wonder about the direct correlation between OFM values and AOFAS/FFI scores. The AOFAS and FFI are unidirectional (high is good/low is bad and vice versa for the different scores) whereas the OFM has an optimal value in the middle, and higher or lower values away from this optimum are both bad. So maybe deviation from optimal rather than absolute values of the OFM would be better?</p> <p>3. One of the main stated conclusions is that "the evaluation of scores can make a valuable contribution to the develop and evaluation of survey instruments..." This wasn't directly assessed and therefore shouldn't probably form a main conclusion I think (or else justified as a conclusion).</p> <p>Minor comments Line 163 - I would include here a summary of the "theoretical mathematical weaknesses" (as described in the discussion) Line 219 - I'm not sure what is meant by "two to four feature characteristics" Line 369 - I'm unclear as to why reduced ankle power suggests that the AOFAS is a sensitive indicator for ankle osteoarthritis.</p>
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VERSION 1 – AUTHOR RESPONSE

Response to reviewers:

Thank you for considering our work. We appreciate the reviewers' suggestions aimed at improving the quality of our paper and have carefully considered and responded to each of the comments and suggestions as described below.

Reviewer 1:

ad 1) The clinical measures addressed by the AOFAS-AHS are mobility in ankle joint and subtalar joint. All patients were chosen during polyclinic examination by an experienced orthopedic surgeon with expertise in foot and ankle surgery. No patient with compensatory movement or laxity in the Lisfranc's and the Chopart's joint line was found in that group. With regard to skin movement and the normal movement in Lisfranc's and the Chopart's joint line in plantar- and dorsiflexion as well as in adduction and abduction, we took the range of motion from hindfoot to tibia in dorsi- to plantarflexion

as an indicator for ankle joint movement and from hindfoot to forefoot to exclude compensatory hypermobility. In analogy, hindfoot to tibia internal to external rotation was a measure for subtalar mobility while forefoot to tibia abduction to adduction was considered to exclude compensatory movement. The decision which kinematic and kinetic variables are relevant for this research question is mainly based on and derived from the introduction section with the appropriate literature. In particular, it has been shown (references 17-21) that in patients with osteoarthritis and pre-osteoarthritic disorders in the ankle and subtalar joints, reduced walking speed, reduced step length, reduced range of motion (ROM) within different sections of the foot and ankle joint and reduced ankle power generation during push-off are characteristic gait variables and thus are usually used in this patient group.

In addition, we added some information in the methods section (page 13, lines 405-408) to clarify and justify the selection of the gait parameters.

ad 2) In all of our patients pathological conditions were proven by X-ray, CT- or MRI- scans (p. 7, ll. 222-224). Due to the combination of radiological imaging, medical history and clinical examination, we can state that the patients not only showed gait deviations from normal findings, but suffered from osteoarthritis and pre-arthritis conditions (see also our comment above).

Reviewer 2:

ad 1) The aim of the entire project was to validate the German translation of the AOFAS-AHS. After cross-cultural adaptation (see reference 11), an agreement analysis was carried out showing no good agreement between the AOFAS-AHS and the chosen reference, the FFI-D (see reference 12). We agree with you that we cannot directly assess the validity of the two rating scales. Therefore, we clarify that the present study was performed to determine, which of these two scoring systems correlates better with objective findings from gait-analysis (p. 7, ll. 199-203). Focusing on the hindfoot and ankle joints we used the OFM to get more detailed information regarding objective functionality. Additionally, factor analysis was carried out to verify whether redundancies or similar items exist in both scores. As mentioned, we did not find any redundancies or interchangeable items. Furthermore, factor analysis did not support the division of the FFI-D into two subscales, postulated in previous literature.

To avoid any confusion we adapted the title.

ad 2) We correlated the total range of motion in the ankle and subtalar joints as identified by the OFM with values identified during clinical examination and "translated" to score values. Since in our patient no pathological extended ROM was stated during clinical examination and all of our patients showed more or less reduced ROM, we could expect a higher ROM as an indicator for a "more normal" ROM. Furthermore, reduced walking speed, reduced step length and reduced maximum ankle power generation during push-off were taken into account and correlated to gait abnormalities described in the scores – again "translated" into score values. Doing an extended analysis by regarding the deviation from the gait parameters of our patients to gait parameters from healthy persons would exceed the goal of our study, especially, since we would meet the ceiling-effects of the AOFAS-AHS and – as known from our results from cross-cultural adaptation – of the FFI-D as well.

ad 3) As mentioned above (our response to your main comment 1), this study focused on the correlation between objective physical foot function using the OFM and perceived disability using two different foot scores in patients with mild to severe ankle and hindfoot pathologies. We clarified this point in the conclusion sections of the abstract and the main text. Our results suggest that gait analysis is able to assist in determining whether a score is able to measure foot and ankle dysfunction. Therefore, we included our statement that these objective parameters should be taken into account while developing and validating scoring systems as part of our "outlook" at the end of the discussion section (p. 13, ll. 403-408).

ad "minor comments":

Line 163 - the theoretical mathematical weaknesses are now added.

Line 219 – 2-4 "feature characteristics" has been replaced with "possible responses".

Line 369 – Our literature references (17, 19, 21) state that reduced ankle power generation during push-off is an indicator for osteoarthritis. As we found reduced ankle power generation during push-off as well as a significant correlation with the AOFAS-AHS total score in our patients with ankle arthritis and pre-arthritic ankle and subtalar disorders, we stated that the AOFAS-AHS might be useful to indicate patients with ankle osteoarthritis.

Again, thank you for considering our work and kind regards.

Tanja Kostuj for the author's group

VERSION 2 – REVIEW

REVIEWER	Dr Andrew Buldt La Trobe University, Australia
REVIEW RETURNED	07-Jan-2018

GENERAL COMMENTS	I thank the authors for thoroughly addressing all points raised during the review process and i am satisfied that all issues have been adequately addressed
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REVIEWER	Julie Stebbins Oxford University Hospitals NHS Foundation Trust, UK
REVIEW RETURNED	26-Jan-2018

GENERAL COMMENTS	Thank for the opportunity to review your manuscript. I am satisfied with the revised version.
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