Author's response to reviews

Title: Relationship between foot function and medial knee joint loading in people with medial compartment knee osteoarthritis

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Author's response to reviews: see over
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Dr Mike Potter,

Editor

Journal of Foot and Ankle Research

Re: Revised MS: 3750460379707055 - Relationship between foot function and medial knee joint loading in people with medial compartment knee osteoarthritis

Dear Editor,

We would like to thank the reviewers for their comments and constructive feedback. We appreciate the opportunity given to amend the manuscript and resubmit to the editor for consideration for publication in Journal of Foot and Ankle Research. We have attached a revised manuscript and have addressed the comments of the reviewers. The changes in the manuscript are presented in bold. Our responses to the reviewers’ comments are presented below.

Sincerely yours,

Dr Pazit Levinger
REVIEWER 1: Ru-Lan Hsieh

Major Compulsory Revisions
This study examined the relationship between foot function and medial knee joint loading in people with medial compartment knee OA. I have some comments as listed below:

1. The case number was too small.

2. Lack of power and sample size calculation.

Author’s response:
This project was part of a larger study that investigated gait (swing phase mechanics particularly minimum foot clearance), balance and falls risk in people before and after knee arthroplasty. A power calculation to determine the sample size, therefore, was based on minimum foot clearance parameters. Data from a previous study which investigated the toe clearance of elderly fallers and non-fallers were used to determine the number of participants required. A sample size calculation indicated that for 80% power and a $p$ value of 0.05 at least 25 participants were required. To mitigate the possible effect of subject drop out for the surgical group, a total of 32 participants were considered to be sufficient. This has been added to the methods (page 3).

3. In the introduction, the authors claimed that compared to controls, people with medial compartment knee OA have a relatively pronated foot. They also claimed that footwear and orthotic interventions aim to reduce the knee adduction movement is by pronating the foot through lateral inclination of the insole. In the present study, the results showed increased foot pronation is associated with reduced medial knee joint loading. Therefore, the authors claimed that medial knee joint loading is reduced in people with OA who walk with greater foot pronation. However, there was lack of the foot position of the participants in the present study. Do they belong to normal foot position, pronated or supinated foot position? Different foot position would affect the medial knee joint loading differently. Therefore, the authors should give us their static foot posture firstly, and then re-analyze the data by sub-classifying them according to normal foot, pronated foot, and supinated foot, such as using the Foot Posture Index.

Authors’ response:
Our previous work with the same population included a comparison of foot posture between the current knee OA group with age matched asymptomatic control group [1]. We have shown that the knee OA group has a relatively pronated foot type as indicated by the Arch Index and Foot Posture Index. Therefore our results indicate that increased foot pronation is associated with reduced medial knee joint loading. We have amended the text of the paper to clearly reflect that this is the same sample population as our previous work (method section page 3 and discussion 3rd paragraph).

4. As the authors discussed in the discussion that “while some studied investigating lateral wedged insoles have reported a reduction in the knee adduction moment, others have reported an increase in knee adduction moment.”—These findings support the suggestion
that there may be sub-groups that better respond to lateral wedged insoles.”, I think the suggestion also fit to the present study. Therefore, the authors should re-analyze the data by sub-classifying them according to normal foot, pronated foot, and supinated foot, such as using the Foot Posture Index.

Authors’ response:
In our sample population the participants from the knee OA group exhibited a relatively pronated foot type (as indicated in our previous work) [1]. While sub-classification according to foot type could provide further information about the link between medial joint loading and dynamic foot function, we are unable to conduct such an analysis as the knee OA group are homogenous in relation to foot posture (i.e. they have a pronated foot type).

5. How the authors explain the condition of patient with knee OA with increased knee adduction moment with already existed pronated feet to walk in more pronation, that is over pronation, to reduce the knee adduction moment?

Authors’ response:
The findings of the present study indicate that increased eversion is associated with reduced medial loading. However, given that some patients with medial compartment knee OA may exhibit a pronated foot type, over pronation with the use of load-modifying interventions to reduce knee joint loading may not be appropriate as it may lead to development of symptoms in other lower limb regions. The authors believe that appropriate individual screening of the lower limb may need to be undertaken (including static and dynamic evaluation) to assess the suitability of certain interventions to achieve optimal clinical outcomes [1, 2]. This is also discussed in the last paragraph of the discussion and in the conclusion of the current paper.

6. The participants included in the present study only fitted the radiographic criteria. There was lack of clinical severity, such as pain intensity, physical function, etc. These factors would affect the gait performance.

Authors’ response:
The Western Ontario and McMaster University Osteoarthritis Index (WOMAC) [3] has been recorded in this patients group and is now included in the paper (method section and results in page 5). The knee OA group reported mild pain of 171.8 ± 99.9, function 502.5 ± 330.9 and stiffness 83.7 ± 49.8, with WOMAC total score of 758.1 ± 447.1.

REVIEWER 2: Martijn Steultjens

This is an interesting paper that aims to improve our understanding of how foot biomechanics might affect knee joint health. It is a timely and novel piece of work. Nevertheless there are three issues that need to be addressed:

Major compulsory revisions

1. The authors build their case on the relevance of the knee adduction moment (KAM) to osteoarthritis (OA), and cite a number of studies that have identified the association between KAM and OA-related parameters. Here, the authors should be careful not to
cherry-pick their evidence. A recent systematic review of the KAM literature by Mills et al. (Arthritis Care Research 2013, epub ahead) concludes that there is no consistent evidence for elevated KAM in OA, or of clear relationships between KAM and OA-related parameters. As a bare minimum this should be acknowledged and discussed in the paper.

Authors’ response:
There have been 2 systematic reviews pertaining to the relationship between knee OA and KAM. The Foroughi et al systematic review published in 2009 [4] concluded that while only 2 studies found that KAM was greater in people with knee OA compared to controls, there was good evidence that KAM was related to knee OA severity and varus malalignment. The more recent review by Mills et al [5] focused largely on gait differences between those with and without knee OA and concluded that the evidence for differences in KAM was inconsistent. Our focus on KAM in the current study relates primarily to its role as a surrogate measure of medial knee loading in people with existing knee OA, rather than its role as a ‘predictor’ of knee OA development. To make this clearer, we have changed the introduction to read (page 3):

“Dynamic joint loading, particularly the external knee adduction moment (KAM), has received attention as an important surrogate measure of the medio-lateral distribution of force across the knee joint. Although the evidence for the contribution of KAM to the development of knee OA is inconsistent [4], several studies have shown increased KAM to be associated with knee OA severity and varus malalignment [5]. Consequently, several treatment strategies, including load modifying interventions, have been suggested to reduce the load on the medial compartment of the knee by altering the KAM [6-12].”

2. The study correlates various kinematic variables from different stages of the gait cycle, e.g. peak 1st KAM at on average 19% of the gait cycle with peak rearfoot eversion at 30%. The authors suggest this might explain lack of correlation between 1st peak KAM and foot kinematics. Would it therefore not make sense to correlate characteristics at the same point in the gait cycle, e.g. using amount of rearfoot eversion at the time of 1st peak KAM, rather than peak rearfoot eversion?

Authors’ response:
The reviewer has raised an important issue which the authors thoroughly considered prior to undertaking this analysis. There are two key reasons why such approach was not adopted. Firstly, the current paper builds on our previous work that reported differences between the knee OA group and age-matched controls in these foot parameters at the same specific points of the gait cycle [2], so we considered it appropriate for the correlational analysis to be consistent with this. Secondly, the issue of variation in timing of peak KAMs is largely addressed by our use of the KAAI, which takes into account both the magnitude of load and the duration of stance. Given that this measure is not affected by the timing of peak KAMs it provides further support to our finding about the association between peak eversion and medial joint loading.

3. The system used to classify OA severity is unknown to me. The established system is the Kellgren and Lawrence grading scale; why did the authors not use this? It must be acknowledged that the K&L grading is flawed, but unfortunately the authors’ own system appears to have the same flaws (focus on indirect evidence of cartilage loss and limiting the role of bone features to severe OA).
Authors’ response:
We used the method by Brandt et al [6] to classify knee OA, as this is the approach used by the orthopaedic surgeons who recruited participants for the study. The Brandt approach has been shown to have equivalent diagnostic accuracy as the K&L scale in identifying articular cartilage degeneration determined by arthroscopy [7].

References