Reviewer's report

Title: Investigation of the Biomechanical Effect of Variable Stiffness Shoe on External Knee Adduction Moment in Various Dynamic Exercises

Version: 1 Date: 30 January 2013

Reviewer: Richard Jones

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Overall, I feel that the paper lacks two main aspects: A rationale for the study and also the choice and analysis of variables is weak. I would like the authors to comment on the below comments:

Major Compulsory Revision

1. What is the rationale for the tested activities as I do not see this anywhere in the article?
2. Is there any rationale that reducing the EKAM in healthy participants will reduce OA progression?
3. Line 48: Would OA patients actually do those dynamic activities, rationale is needed?
4. Line 87: Not sure of relevance of Table 1. This should be deleted and summarised in the text.
5. Line 95: Reference 9, 10 and 11 are not variable stiffness studies.
6. Line 96: Is there a high prevalence of OA amongst athletes, you have not demonstrated this with useful epidemiology data in the introduction. If you take Chakravarty et al. (2008), they showed that long distance running does not predispose you to OA!! More information is needed.
7. Line 98: Define beneficial effect
8. Line 111: More is needed on how the ratio was determined.
9. Line 114/line 115: were the uppers similar, were the subjects blinded to the condition?
10. Line 121: What was the sampling frequency of the force plates?
11. Line 123/124/126: Please detail more on the marker set used, how were the segment coordinate systems defined. Why were markers removed from shoes - how was the foot constructed?
12. Line 128: Which reference system was used, where exactly were the variables taken from?
Line 142: Did randomisation occur?
Line 144: Why only three trials - is this enough given the likely variability in the movements?
Line 149: Please reassure me that you have not just used the average curves to get the variables? Did you examine each trial?

Line 149: Please explain your choice of variables. Why have you not calculated KAAI or examined the flexor moment which Walter et al. (2010) has showed that this needs to be investigated in terms of reduced medial contact force? Lever arm and also ankle eversion would of been useful to see.

Line 172: This should be in the methods as there is no mention of this until here. Some indication of the values are needed.

Line 200: How many forefoot runners were there in the sample?

Line 232: Whilst this may be true, the gait instability in the elderly OA patient would deem if the VSS actually works and therefore this needs rephrasing.

Line 2343: I agree that VSS are potential treatments but the reduction is similar to lateral wedge insoles. The conclusion has already been stated by Erhart et al amongst others with VSS so I am unsure what this has added to the literature.

Line 249: Is it only the medial GRF that has changed, what about ankle eversion of the COFP? If running shows this and the other activities don't what changes the ekam in those activities. Please explain.

Figure 2: I would like an explanation of how the joint centres were constructed and whether markers were on shorts as per figure.

Figure 3: Walking: How is toe-off at the peak of an EKAM? In the running graph, is this not normalised to stance phase? I would be very surprised if this was an average graph for all subjects.

Table 3: EKAM at toe-off: Is this the ekam second peak and not toe-off as only inertial factors would be in the ekam at toe-off?

Table 4: Why only present running values?

Minor essential revisions:

Line 44: change to results showed that the ekam will be

Line 55: Reference needed

Line 69: Please rephrase as poor English

Line 69: Is it due to or potentially due to?

Line 90: this sentence should be before line 87 'As therapeutic...' 

Line 126: remove will and change to remained

Line 153: Were the data normally distributed?

Line 159: Walking speed was increased for VSS and you still showed a reduction in EKAM so I wonder if EKAM would have been further reduced if speed was identical?
**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Needs some language corrections before being published

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

I do not have any competing interests