Reviewer's report

Title: Coordination among the rearfoot, midfoot, and forefoot during walking

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Reviewer: Alexander Izod

Reviewer's report:

Thank you for giving me the opportunity to review this manuscript. This was an interesting study to review which presents some interesting concepts that may be applicable to the clinical investigation of a number of pathologies.

My overall impressions of the manuscript are that to be publishable more work is required in order to clarify to the wider readership elements of the underlying rationale for the work, the methodology and the interpretation of the findings.

Regarding the Methodology:

Where were the participants recruited from?

Why is foot deformity assessed using the concept of the "too many toes" sign? What was the rationale behind this? Why did the study not use a quantification technique such as the foot posture index (FPI-6)?

Who are the "internal review board"? I presume these are an ethics committee but where are they based?

When listing the sites for marker placement according to the Leardini protocol it would be useful to be more specific regarding their exact position at sites such as the metatarsal heads.

The manuscript states that the stance phase was analysed "according to previous studies" - what does this mean exactly?

It would be helpful to clarify why a treadmill was used when analysing gait. Why was each participant required to walk at 1.3 m/s specifically? Where does this methodology derive from and why did you choose this technique? Why did the study not analyse gait using level over ground walking at self-selected walking speed? Did this approach have any bearing on the results of the study i.e. could standardising spatial-temporal parameters have affected the underlying kinetics of the foot and hence affected coupling relationships?
Regarding the Background to the Study:

The document refers to previous research that has investigated coupling relationships between both adjacent and non-adjacent segments. Previous research has also explored the coupling relationships of segments rotating in opposing planes. In addition, although there is reference to more extreme abnormalities of foot posture i.e. pes cavus and pes planus, to strengthen the clinical applicability of this research it would be helpful to clarify explicitly what the rationale was for studying the adjacent segments and the rotation patterns chosen for this study?

The manuscript highlights the limitations of the Pearson's correlation technique and cross correlation. Although the limitations of these approaches are highlighted later in the document it might be useful to clarify more explicitly at an earlier stage within the document what the limitations of these techniques are.

To the wider readership unfamiliar with this topic it would be helpful to explain why angular amplitude parameters are "not understandable"?

The manuscript refers to reference 15 (Arnold et al., 2016) as also having investigated coordination patterns but did not explain the relevance of this work.

The manuscript refers to Cheng et al (2008) by comparing their results with those of Bosjen Moller (1979) but did not offer an explanation as to why these two studies may have provided differing results.

Regarding the Results and Discussion:

The manuscript presents a description of the coupling relationships between adjacent segments during the stance phase which show a predominance of midfoot motion. How do these results concur or differ with what is currently understood regarding foot motion during gait? This is an area which could be expanded further within the manuscript.

Whilst the manuscript is careful to describe this research as a preliminary study, can we necessarily describe these results as being representative of normal foot function? These results are specifically representative of these data in these participants. Although presumably asymptomatic, it is difficult to contextualise these results as the underlying foot posture characteristics of these participants are not quantified.

How can this research be used to inform the assessment of lower limb biomechanical function, clinical decision making and treatment interventions?
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