Reviewer's report

Title: Multi-segmental Foot Motion during Gait in Children

Version: 2  Date: 26 June 2014

Reviewer: Ryan Mahaffey

Major Compulsory Revisions

1. The title does not inform the reader of the scope of the manuscript. Acknowledgment of the modification of the IOR foot model is warranted.

2. The authors state that the new anatomical reference frame for the hallux improves robustness of the segment. However, no definition or measure of robustness is given. A comparison with previous work by Leardini et al (2007) may not be relevant due to the difference in participant’s age (adolescence compared to adults). Both F2Pt and F2Ps should be presented using the modified and the original foot model so robustness and consistency may be compared.

3. The modification of the calcaneus in the frontal plane was compared between the modified and original foot models. However, considering the modification “valgised” the calcaneus, it could be assumed that most if not all calcaneal frontal plane orientation would be more valgus and yet 9 feet showed more valgus and 9 feet are in more varus orientation. This result needs explaining, can it be described as “valgisation” if the offset is 50% varus and 50% valgus?

4. The authors state that the MLA angle is based on Moreau and Costa-Bertani angle. As I understand, the Moreau and Costa-Bertani angle has an internal and external parameter. However, the manuscript does not mention which is being represented; one would assume the internal angle? If it is the internal Moreau and Costa-Bertani angle does the sustentaculum tali marker represent the appropriate landmark to represent this angle? I believe the internal angle is taken from the lateral view of the foot from the vector between the medial sesamoid and the talonavicular joint and the vector between the talonavicular joint and the posterior calcaneal. Clarification on the representation of this clinical measure should be considered together with why this clinical MLA angle was used rather than other clinical definitions of MLA including the use of the medial malleolus and navicular markers (see Razeghi & Batt, 2002, Gait and Posture; 15(3):282-91).
5. The references are out of sync with the text particularly in the methods section (lines 142 and 144). Reference should be reviewed and reorganised throughout the manuscript.

Minor Compulsory Revisions
6. The abstract states (line 66) “high intra- and inter-participant repeatability”, but this was not mentioned or measured in the main text results. The abstract should summarise the main text.
7. Line 98 – “joint had be sought as to avoid” needs rephrasing
8. Line 99 - “singularities arising for large flexion angles” change to “singularities arising from large flexion angles”
9. Methods (line 110) - “participants….. [had] possible pes planus” How would this affect the results regarding frontal plane orientation of the calcaneus? You would expect more valgus orientated feet from the participant regardless of the modification to the foot model. This may negate the comparison with “typical clinical observations of valgus or neutral calcaneus” reported in the discussion (line 196-197) and comparison with previous literature (e.g. Leardini et al 2007). Clarification on this as a potential limitation is required. Perhaps a clinical measure of calcaneal frontal plane orientation should be considered in order to compare with the results foot model rather than just stating (line 112-113) “all participants had normal feet presenting a hinfoot frontal plane inclination lower than 7 deg valgus”.
10. Line 111 – “medial longitudinal arch has” change to “medial longitudinal arch as”
11. Line 163 – “patterns the rotation” rephrase
12. Discussion (line 183-184) – “…less expected…MLA angle in static up-right posture was larger than 180 deg”. This would infer that the sustentaculum tali was very near to the floor. If the representative Moreau-Costa-Bertani angle is considerably more than what would be expected can normative values be presented? Furthermore (line 186-187), “…accounted for by the participants’ young age… not fully developed foot arches are considered physiological”. One would not expect such a large MLA angle from age alone and the authors should consider the definition of the MLA angle used in the IOR foot model.
13. Figure 1B and 1C are labelled incorrectly. I believe the labels should be switched around

Minor Discretionary Revisions
14. The reference (line 309) for Mahaffey et al 2012 [17] is from a conference proceeding, there is a full article here: Mahaffey et al. Journal of Foot and Ankle Research 2013, 6:43

Level of interest: An article of importance in its field
Quality of written English: Acceptable

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

Declaration of competing interests:
I declare that I have no competing interests