Reviewer's report

**Title:** Improvement of walking speed and gait symmetry in older patients after hip arthroplasty: a prospective cohort study

**Version:** 1  
**Date:** 4 March 2015

**Reviewer:** Joe Zeni

**Reviewer's report:**

- Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)
  
  • Line 32: When describing differences, what is meant? Is this compared to control subjects, compared to the non-operated limb?
  
  • Line 33: What is meant by disease severity? Radiographic severity, symptoms, duration of disease?
  
  • Line 40: The references to these other conditions seems out of place.
  
  • In Figure 3, there are no indications of which changes were significant.
  
  • Lines 136-139: What is meant by overlap? This procedure is not clear and I recommend the authors improve the clarity of this section for readers not familiar with this procedure.
  
  • Line 152: Why was gender included in the model? There is no rationale in the introduction or hypotheses related to this analysis.

- Major Compulsory Revisions (which the author must respond to before a decision on publication can be reached)
  
  • Line 53: The authors state that the inertial sensors are valid for measuring symmetry in healthy subjects, but do not state whether this is a valid tool to use in a pathological population where the expected symmetry would be much lower than a healthy cohort. Have any studies validated this tool in a pathological population?
  
  • Lines 68-69: Including a sample with a known pathology on the contralateral hip may skew the results. Symmetry in this subsample may be a result of decreased performance on the original side, not due to improvements in the operated side. When were the contralateral THAs performed? More information about this potentially confounding event is needed.
  
  • Lines 122-125: The description of the event calculations is not clear. The authors appear to state that the detection of the initial contact is not detectable using these sensors. I believe the authors are identifying the foot flat instant and then subtracting 50ms from this time as a surrogate of initial contact. However, this is not appropriate without substantive rationale for this procedure. This is an important consideration because quantification of symmetry is based on valid measures of gait events.
• The statistical approach and results do not match. There are no data supporting the initial ANOVA, instead the authors only appear to present data from post-hoc testing in which each time period is compared. There is no data showing main effects of time in the walking speed results section.
• Similar to the preceding statement, the authors present data for the women and men between each testing time for walking speed. However, given their statistical approach, there was no interaction effect for this analysis. Therefore, it is not appropriate to separate men and women along with time, unless that was an a priori hypothesis.
• Line 161: The authors state walking speed increased, but do not provide P-values here or state whether they are referring to the fast, slow or averaged walking speed.
• Line 169: What is being measured here as 23%? A difference between men and women or a difference between normal and fast walking speeds? This is not clear.
• What is the rationale for taking the mean of the normal and fast walking speeds (Table 2)? Is this a valid measure of performance?
• The same statistical issues arise for the step and stride regularity results in that the outcomes from the ANOVA are not correctly presented in the text. The authors state “Although the autocorrelation coefficients for P1 increased from TD1 to TD3 in patients with THA” there is no statistical data to support this statement.
• Lines 182-183: This statement is not appropriate: In female patients with THA, the increase from TD1 to TD3 was apparent but not significant (P>0.050)”. If it was not significant there was no difference. The discussion section can be used to explain the results, but if you have determined 0.05 to be a cutoff for your significance, then there was no difference if p>0.05.
• There is no description of the rehabilitation protocol that was taking place during this time. This is an important consideration as the type of rehabilitation likely has a large effect on the outcomes. Was symmetry being specifically trained during this rehabilitation protocol?
• What surgical approaches were used in this sample?
• Were all patients undergoing THA because of osteoarthritis progression or did subjects also undergo THA for avascular necrosis, rheumatoid arthritis, hip fracture, etc.?
• Lines 237-239: This statement requires additional studies and evaluation” “These results are relevant for rehabilitation and we propose that female patients should be more intensely advised and encouraged to walk faster, even if they might be out of their comfort zone”. There is serious concern that for women walking slow may be a mechanism to prevent falls in the presence of physical impairments, such as muscle strength and motor performance. Perhaps rather a more appropriate strategy would be to improve these underlying impairments to increase walking speed, although this requires additional study.
In general, this is an interesting paper with some value to researchers in the areas of biomechanics and clinical outcomes after joint arthroplasty. The statistical analyses and subsequent results are inappropriate as written and prevent the reader from an accurate interpretation of the results. There is a lack of detail pertaining to the rehabilitation protocol, the surgical sample, and the rationale for the analysis based on gender. More clarity is needed on the methods used to identify events, as this is the basis for all symmetry measures.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Statistical review:** Yes, and I have assessed the statistics in my report.

**Declaration of competing interests:**

'I declare that I have no competing interests