Reviewer's report

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

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Reviewer: Katherine Boyer

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BMC review- Improvement of walking speed and gait symmetry in older patients after hip arthroplasty: a prospective cohort study.

Overall this was an interesting study that examines change in walking speed and gait symmetry in total hip arthroplasty patients during an inpatient rehabilitation period. The initial question is well posed and the experimental design and methodology appear sounds. However, while this is an interesting question with an innovative study design, the manuscript lack details throughout making it difficult to understand the data treatment, results and discussion. Detailed comments below provide indicate the major compulsory changes needed.

Introduction:
I would like to see some background on asymmetry in OA gait in the introduction. Given that aim of this study is to examine the improvement in gait symmetry in THA patients it would be nice to know how asymmetrical unilateral OA patient are during walking. A quick PubMed search indicates there are at least two studies to examine this. Lugade et al., 2010; James et al., 1994. This will help in the discussion and interpretation of the results.

Methods:
Paragraph 2- The inclusion of patient with bi-lateral arthroplasty may influence the symmetry measures of this study? Are they really needed in this analysis? The message of the study may be stronger if only unilateral patients are considered.

Paragraph 3- selection of the reference group from a training group at the university may introduce physical activity as a confounding variable in the walking speed results. Please consider in the discussion of the results.

Please include more details on the gait training course at the rehab center.

Line 106-106- Please include a more detailed description of the offset correction and coordinate transformation for the inertial sensor unit.

Signal processing (Line 120-133) Without a visual reference it’s difficult to follow the methods used to identify heel-strike. It’s not clear what a “trigger with constant negative delay of 50ms” is? Please include a sample trace/figure to illustrate how heel contact was identified. Perhaps label figure 1 with these points to help the reader locate heel-contact.
The parameter calculation is difficult to follow. What portion of the signal is being analyzed in each autocorrelation calculation? Is it the entire signal (20 steps) or are left and right leg foot contacts for each stride compared. A sample plot of at least a portion of the auto correlation coefficient plots where the first and second peak (P1 and P2) were determined is needed.

Statistical analysis - What is the motivation for including Gender in the statistical model? Is there evidence from the literature that symmetry differs by gender or that the response to the gait training would be different by gender? Include this in the introduction and the study hypothesis.

Figure 2: is this a THA or Reference group subject? If THA, the contralateral and THA leg labels would make more sense.

Results:

The results should include a presentation of the statistical model main effects before the results from the post-hoc testing are presented. Were there significant gender effects and time effects?

If improvement in walking speed is the primary outcome metric then the starting speed, and difference in speed by gender, is not that important. Consider de-emphasizing the difference in gender speed differences.

Discussion:

The rehab program is called different things throughout the paper please be consistent.

Line 223-224 – Change to: At TD3, there was not a significant difference in walking speed between male patients with THA and the male reference subjects.

Line 221-229 Have walking speed improvements post THA been reported elsewhere? Refer to the appropriate literature to put this studies results in the context of others that may not have used an intensive rehab program.

Line 221 – 241 There is too much speculation on walking speed differences between males and females. Could males and females not walk at different speeds simply because they have different leg lengths? Given that females could walk at speeds similar to the reference subjects how relevant is this difference for understanding THA rehab? Beyond the difference in age there is no data available in this study to support any of the other possible explanations.

Lines 242 – 249- In this paragraph there is a discussion of an “stationary” phase of the rehabilitation program. What is this and how long is it? Please add to methods.

Line 248-253- This paragraph indicates that “daily force mobility, flexibility and coordination training” are part of the program and that it lasts for about 27 days. The authors also suggest that this may be too short a time to completely reverse the asymmetry.

I agree with the author here and thus was surprised with the explanation of the asymmetry in THA patients was explained in the next paragraph (line 255-265) to be due to patients needing to unlearn a gait pattern they may have adopted to
avoid pain. While this “motor program” is certainly one explanation for the lack of symmetry in the THA patients. An equally possible explanation is that with pain, joint degeneration and altered gait patients with hip arthritis may also suffer from significant muscle strength losses and inhibition of muscles due to pain. It would not be possible to regain the strength in a 27 day program. Especially given the possible strength loss on the symptomatic side would have progressed over years and not days.

A discussion of the study limitations should be included.

**Level of interest:** An article of importance in its field

**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 declare that I have no competing interests