Reviewer's report

Title: The reliability of postural balance measures in single and dual tasking in elderly fallers and non-fallers.

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Reviewer: Lorenzo Chiari

Reviewer's report:

The paper by Swanenburg et al. estimates the test-retest and inter-rater reliability of six COP-based measures of postural sway in a sample of 37 elderly community-dwellers. Interestingly enough the study extend over previous studies by 1) including fallers in the elderly population under investigation, and 2) including dual-task conditions in the analysis. Methodology is appropriate and the topic is relevant. Results show good reliability in group assessment for the chosen measures.

*Major compulsory revision

1) Methods: the duration of each trial is only 20 s which is a very short time compared to common clinical practice in quantitative posturography, even after Le Clair and Riach. Also, all previous reliability studies dealt with trial durations ranging from 30 to 120 s. Authors should provides arguments and better defend this choice.

*Minor essential revisions

1) Variables names: authors should try, when possible, to use the names mostly commonly used in the literature, in order to facilitate the immediacy and comparison of their results with previous authors.

2) I then have to raise some general concerns mostly related with the readability of the paper that, in my perspective, should be improved. Specific comments are listed in the following.

Specific comments

Note: line numbers cited below always starts at the beginning of the section or subsection being reviewed.

Abstract

Methods:

3) After checking if these are in fact the measures which were computed (e.g. compare with Prieto et al., Measures of postural steadiness: differences between healthy young and elderly adults. IEEE Trans Biomed Eng 1996;43:956–66), my proposal is to change the second sentence as follows: “A forceplate was used for registering postural variables: the maximal and the root-mean-square amplitude in medio-lateral (Max-ML, RMS-ML) and antero-posterior (Max-AP, RMS-AP)
direction, mean velocity (MV), and the area of the 95% confidence ellipse (AoE)."
Of course the name of the variables should be then changed all the way through
the manuscript accordingly.

4) Last sentence of this section is not clear and hard to read. Consider
rephrasing.

Results:

5) Line 2: ‘correlation coefficients’ should be ICC.

6) Lines 2-4: “The SDD values were for variable …, for MV …, and for AoE …”

Background

This section is complete and useful. Only, there are some flaws in the description
of the state of the art about postural measures (first paragraph).

7) Lines 5-7: “Generally the root mean square (RMS) of COP amplitudes … is
used [3,4,5]”. This sentence is not very precise, both because other COP-based
measures are often used and I’m not sure which is the most popular, and
because not in all cited references this is used. E.g., in ref. [3] Corriveau and
colleagues use the RMS of the difference (COP-COM) which is not the same
variable.

8) Page 1, Last but one paragraph: reference [15] is omitted and is nowhere else
cited in the manuscript.

Methods

This section needs some reorganization. In fact, even after several readings, and
before reading the Results section, some information are missing and some
others are hard to interpret.

9) Specifically, I do believe it is necessary to anticipate the presentation and to
reorganize the content of Tables 1 and 2. This is because more information are
needed in the Methods about the participants, including their base-of-support
area that is now missing but should be reported, as it was freely chosen from
subjects. Hence Table 2, except the bottom part related with the results of the
group score, could become Table 1 and be included in the Methods. Also, the
content of Table 1 is needed to understand the Cognitive Difficulty Score that is
presented in this section. This could become Table 2 in the revised manuscript.

10) The titles of some subsections are not precise or exhaustive. Hence, I would
propose the following headings: ‘Equipment’ could become ‘Experimental
procedure’, incorporating also the content of the current ‘Measurement design’
subsection; ‘Vision’ could become ‘Visual conditions’. In the following I will refer
to the current headings of the manuscript.

Equipment:

11) Page 3, first para: acronyms are missing: ‘These provide the COP
coordinates...in the anterior-posterior and medial-lateral direction
(Max-AP,Max-ML),…’

12) Page 3, first para: definition not clear: ‘…from the centroid in x-axis’?
Cognitive task:
13) Page 4, first para: the starting number for counting backward (range 80-99 or 121-199) was somehow included in the GS? Also, the procedure by which the CDS was estimated should be made clearer. The score was obtained by growing or decreasing numerical complexity of the trials?

Vision:

14) Page 5: authors say that participants were instructed to look at a cross (1m x 0.5 m) at 1.5 m of height. Which was the alignment of the cross arms? Included information on the visual vertical or not? What does (1m x 0.5 m) mean? The height was fixed regardless the participants’ height? Please, clarify and comment possible limitations and concerns.

Results
This section is concise and well written. Tables 3 and 4 are the heart of this manuscript and particular attention should be paid to their completeness (some measurement units are missing, where are the data about the fallers sub-population?) and readability, even in their preprint.

Reliability parameters:

15) Page 7, line 5: ‘correlation coefficients’ should be ICC. Why just the results in the AP direction are reported here?

Discussion
This section is clear but some issues are maybe not adequately discussed.

16) Page 8, line 3: “This study showed good reliability parameters for the fallers although in the non-fallers group the values were higher (see Table 3)”. Not clear if and where the reliability results for the fallers are presented in this manuscript.

17) Page 8, line 12: “Our participants … a predetermined stance position of pelvis width”. This statement might be stronger if you were able to report the BOS of your subjects, and how far they were from pelvic width. Also, either I missed the point or the arguments provided to justify the different results obtained from Corriveau et al (2001) seem not completely sound.

18) Issues that I would suggest to consider for further discussion: deeper comparison of the reliability results obtained in different conditions (single- vs dual-task; vision vs no-vision); differences among parameters; differences between AP and ML directions.

Tables
19) Table 2, legend: BOS is mentioned but does not appear in the lines of the table. Group Score results could be moved to a new, separate table for the Results section.

*Discretionary Revisions

References
1) Ref. [12] is essential? I think it may be hard to retrieve for a common reader of the manuscript while it’s redundant.

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

**Quality of written English**: Acceptable

**Statistical review**: Yes, but I do not feel adequately qualified to assess the statistics.

**Declaration of competing interests**:

I declare that I have no competing interests