Author's response to reviews

Title: Discriminant validity and test re-test reproducibility of a gait assessment in patients with vestibular dysfunction

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Version: 4  Date: 17 September 2015

Author's response to reviews: see over
Dear Mr. Gato,

We greatly appreciated the opportunity to re-edit our manuscript 4850285901546823. Please find enclosed a copy of the re-revised article for review.

With this letter we also would like to thank the reviewers for their comments and recommendations. Below we have listed the reviewers' comments and recommendations in point-by-point detail.

We hope that this revision of the manuscript is now acceptable for publication in BMC Ear Nose and Throat Disorders.

Sincerely, on behalf of the co-authors,

Dr. Eling D. de Bruin
Reviewer's report:
MS: 4850285901546823
Title: Discriminant validity and test re-test reproducibility of a gait assessment in patients with vestibular dysfunction
Version: 3
Date: 1 August 2015
Reviewer: Thorlene Egerton

Comments on revision:
The manuscript is much improved and authors are to be congratulated on their efforts. I am satisfied with their responses and changes to the manuscript apart from the following: “Most of the data were between 2 standard deviations in the Bland-Altman plots, with the exception of a few outliers (1-2) in gait speed and cadence for self-selected walking speed. The Bland and Altman plots for step length yielded 4 data points outside the 2 standard deviations.” These sentences do not say anything about the quality of the assessment technique you are evaluating in the study. In fact they are redundant because the limits of agreement are determined from the data such that most of the data points will always be inside the LOA and a few will always be outside the LOA. Another way of explaining it is that 2SD will always include most of the data. These sentences should be removed as they are redundant but it would improve the paper if there was a comment on the magnitude of the LOA in terms of clinical significance of the outcomes or magnitude of the difference between groups, and about any systematic errors the plot identifies. You could for example, comment that the mean difference was negative in both plots meaning that the second test seemed to be slower (or faster depending on whether you subtracted first from second or second from first). Although you might also argue that the mean difference was very close to zero which indicates no systematic error in re-test. Bland Altman plots need to be discussed qualitatively with regard the magnitude of the LOAs and the mean difference.

Our answer 1.
This recommendation is well received. The sentences: `Most of the data were between 2 standard deviations in the Bland-Altman plots, with the exception of a few outliers (1-2) in gait speed and cadence for self-selected walking speed. The Bland and Altman plots for step length yielded 4 data points outside the 2 standard deviations.`, were deleted from the manuscript.

The manuscript has been amended as suggested by the reviewer and is now to read as (discussion page 8): To be of practical use, the results of the SDD should be interpreted as follows: when taking the measurement error into account, an SDC equal to or greater than 0.05 m/s (table 3) between two measurements should be used as the threshold for a true clinical change in self-selected walking. In the Bland and Altman Plot for self-selected walking speed, the midline showed a mean difference between assessments of -0.03 m/s with a lower limit of (95% agreement) of -0.18 and upper limit of agreement of 0.11 m/s, indicating that the patients walked slower in the re-test. The result of the other assessments in the reproducibility study should be interpreted in the same way (see Table 3, and Figure 1 (self-selected walking with dual task).

And in the next paragraph (Page 9): The Bland-Altman plots showed a small systematic error between test and re-test (~0.03 m/s), albeit this difference did not reach significance.
2. I also noticed that you use “self-defined” instead of “self-selected” in the Figure title and caption. And also that in the figure you use “1.96SD” but in the text you use “2SD”.

Our answer 2.
We thank the reviewer for this feedback. Figure 1: Self-defined was changed into self-selected walking speed for patients with vestibular disorders. Furthermore, 1.96SD was stated in the figure. (‘2 standard deviations’ was deleted from the manuscript (see answer 1).

Furthermore, the capture (Figure 1) was edited and is now to read as: Difference in individual self-selected gait speed between the test re-test sessions, plotted against the individual mean gait speed of the two sessions (m/s). The plot on the left side demonstrates self-selected walking, the plot on the right side self-selected walking speed with performance of a concurrent cognitive dual task. The mid line shows the mean difference (-0.03 m/s left and -0.04 m/s right), dashed lines show the upper and lower limits of (95%) agreement (-0.18 and 0.11 m/s left and -0.27 and 0.19 m/s right).

3. Finally, to be consistent with the manuscript the title should be changed to ‘test-retest reproducibility’.

Our answer 3.
We agree with the reviewer regarding consistency of terminology in the manuscript. The title of the manuscript was edited and is now to read as: Discriminant validity and test re-test reproducibility of a gait assessment in patients with vestibular dysfunction.
Reviewer's report
Version:3 Date:10 August 2015
Reviewer: Robin Criter
Reviewer's report:
Overall, the manuscript is improved since the last review. Specifically, I appreciate the additional information regarding diagnosis and attention to the writing mechanics. However, I see several issues that should be addressed moving forward.

Discretionary Revisions
1. I agree that it is important to note the two patients with BPPV who were treated and cleared of symptoms; however, I do not believe that “cured” is an appropriate word to use in this context.

   Our answer 1.
   We thank the reviewer for this observation. The sentence was edited and is now to read as: `... Two patients were excluded due to being diagnosed with a benign paroxysmal positional vertigo, and diminished vertigo symptoms after treatment,...` (Page 6)

Minor Essential Revisions
2. I still see several spelling and grammatical errors that make the manuscript difficult to read. Additional careful and thorough editing is necessary. For example, line 67 “the degree in which” might be better understood as “the degree to which” and line 342 “however rather” is redundant.

   Our answer 2.
   The “degree in which” was edited into “the degree to which” (page 2) “however rather” was deleted from the manuscript and replaced by “it rather” (page 9).

   The manuscript was checked by a professional writer with an “Australian English” Native Background (Ms. Leanne Pobjoy).

3. The tests described for vestibular system dysfunction diagnosis all evaluate just one semi-circular canal (i.e., horizontal). I recognize that this is common practice; however, it is becoming common practice to test the superior and inferior canals, as well as the utricle and saccule. I would prefer that this is spelled out a little more clearly, that vestibular deficits were noted for the horizontal semi-circular canal (as opposed to the four other vestibular structures).

   Our answer 3.
   We adopted the comment of the reviewer. The paragraph was edited by the medical specialist responsible for the diagnosis of vestibular dysfunctions and is now to read as (page 4): The vestibular testing battery of patients included three-dimensional video or search-coil head impulse testing along all 6 semicircular canals, caloric warm and cold water testing of both ears, subjective visual vertical, as well as ocular and cervical vestibular evoked myogenic potentials. For the purpose of this study, however, the definition of a vestibular deficit relied only on the functions of the horizontal semicircular canals, as assessed with horizontal head impulse testing to both sides (video or search coil system) [34-36] and caloric irrigation (video-oculography) [37].
4. The statement that patients with BPPV were excluded following re-positioning (line 126) should be re-structured for reading clarity.

*Our answer 4.*

We thank the reviewer for pointing out this issue. The statement was edited and is now to read as: The following participants were excluded: after successful re-positioning manoeuvres compensating the vertigo symptoms, if they were not able to walk ten meters independently, had acute pain, uncontrolled cardiovascular disease, hip or knee endo-prosthesis, weakness due to neurological problems, or being known as or suspected of being non-compliant. (page 4)

5. The authors make a point to include that tandem walking is not clinically feasible and that data were not included in the manuscript. However, I still found many references to the “invalid” results in the Discussion section (e.g., lines 264+ and lines 327+). If these data are to be removed from the manuscript, so should the discussion points regarding the data. It would still be appropriate to include a small discussion on the reasons why tandem should not be used in this manner and how they were found to be invalid. Commenting on its “good test re-test reproducibility” is not consistent with the data presented.

*Our answer 5.*

We acknowledge this remark from the reviewer and deleted the following paragraphs and sentences from the manuscript: The only exception was the parameter tandem walking, which showed good test re-test reproducibility, however, poor ability to discriminate patients from healthy controls. Tandem walking also demonstrated rather large SEM and SDC values, indicating ‘large’ within-subject variability and a reduced ability in detecting changes on an individual patient level in clinical practice.

And

*(the exception being tandem walking)*

And

Several irregularities were observed in some participants while tandem walking, such as an overlap of two footfalls. In these cases two steps were interpreted as one by the GAITRite® system. This was possibly caused by the measurement properties of the device and may also explain the relatively large SDCs for all parameters of tandem walking. As tandem walking indicates irregular movement patterns in neurological patients [49], this may explain the poor SDC results obtained in our study.

The results section was edited and now reads:

*For the parameter tandem walking, the GAITRite® software had considerable difficulty automatically detecting footfalls. Stolze, et al. [49] demonstrated that tandem walking in neurological patients consists of short and long steps, crossing of the legs and deviations of the foot from the ideal pathway. As missteps could not be recorded optimally with the GAITRite® system, tandem walking is not recommended as a valid test for assessing patients with vestibular dysfunction using the GAITRite® system. Thus, human intervention was required to process the data from two footfalls to one. As this is clinically not feasible, the measurements were declared invalid and not presented in the manuscript and tables (page 6).*
6. Please clarify if the dual-task paradigm included the first parameter (i.e., self-selected walking speed) or another parameter. I did not see this described in the manuscript.

Our answer 6.
We thank the reviewer for this important comment. The manuscript has been edited accordingly in the method section and table 2 & 3 and now reads (page 5):

And in the capture of table 2 and 3: The dual-tasking paradigm was performed with a) self-selected walking speed and b) dual-tasking (counting backwards from 100 in steps of 7 during self-selected walking speed).

7a. Within the procedure, it is noted that “gait velocity measurement was used to predict falls or hospitalization [42].” The way this is worded made it seem that this was part of this protocol. As I understand it, this statement is linking gait measurement to treatment or adverse effects. Perhaps “can be used to predict falls…” may read better.

Our answer 7a.
After consideration, the sentence “gait velocity measurement was used to predict falls or hospitalization [43],” was deleted from the manuscript.

7b. This leads to my main question regarding Table 1. The tables are much improved; however, your inclusion of “Diagnosis; n (FGA)” is not quite clear to me. Is “Diagnosis” the header for the vestibular diagnoses”? Is “22 (6)” the mean FGA score with standard deviation? The footnote mentions the FGA cutoff score for increased fall risk, although I believe more information is necessary to clarify these results and your intention for including the cutoff score.

Our answer 7b.
The table was edited. The first number represents the totals score of the FGA and the number between brackets the standard deviation. The scores ranged from 3 to 30 points as stated in the next line.

The following information was added to complete the footnote below table 1. The footnote was edited and now reads: “A cutoff score of 22/30 on the FGA provides optimum validity for classifying fall risk in older adults at risk for falling and in predicting unexplained falls in community-dwelling older adults. The FGA appears to predict falls in community-dwelling older adults better than the currently recommended clinical tools (e.g. Berg Balance Scale and the Timed Up and Go Test). This 22 from 30-possible-points cutoff score may be used as indicator for falls in elderly patients with vestibular dysfunctions [58].
Reviewer's report
Version: 3 Date: 30 July 2015
Reviewer: Avril Mansfield
Reviewer's report:
All requested changes have been made - thanks.

Our answer.
We thank the reviewer for this encouraging comment. No further editing required.