**Reviewer’s report**

**Title:** Center of Pressure Characteristics from Quiet Standing Measures to Predict the Risk of Falling in Older Adults: A Protocol For A Systematic Review and Meta-Analysis

**Version:** 0 **Date:** 29 Jan 2019

**Reviewer:** Christopher McCrum

**Reviewer’s report:**

I read the current protocol for a systematic review and meta-analysis with great interest. The authors aim to address the question if and which COP parameters can best discriminate older people who have fallen and older people who have not fallen. Overall, the protocol is clearly written and the plan seems appropriate to address the aim. The authors have carefully followed the relevant guidelines and generally describe their analysis plan in sufficient detail. I have a few general comments for the authors to consider and some specific remarks listed below.

**General Comments**

1) A previous systematic review cited by the authors (Piirtola and Era, 2006) has addressed a very similar aim to the current protocol. I am aware that this review is much older and more studies are no doubt available today on the topic, but I would suggest that the authors outline what this previous review was able to conclude and specify what the current review aims to add in addition to what was already reported.

2) I think that it is problematic to combine studies with retrospective and prospective falls monitoring. Statements about prediction of falls using the COP parameters can only be made using the prospective falls monitoring studies. COP parameters may have been altered due to a history of falls in the retrospective studies and may be diagnostic rather than predictive. I encourage the authors to account for this in their plans in some way. There is also an issue with recall bias in retrospective versus prospective falls studies that may influence the results of a meta-analysis.

3) The introduction and rationale for the review may be strengthened by including discussion on specific mechanisms of balance control that may be better accounted for in specific COP parameters as opposed to the common clinical tests that the authors described. See Hof (2007) and Maki and McIlroy (1997, 2006), for example:


4) Related to the previous point, the reasons for focussing specifically on parameters obtained during stance on two feet is not clearly outlined in the protocol. It is reasonable well established that specifically challenging balance tasks in training can reduce falls risk, so why not also assess COP parameters during single foot stance, for example? They may be more predictive. It would be useful if the authors could clarify their choice on this point.

Specific Comments:

1) Title and throughout - I would encourage the authors to use "older adults" instead of "elderly" as the former is generally more acceptable.

2) Abstract Background: "Currently-available clinical tests are insufficiently sensitive…". I would recommend that the authors adjust this phrase to reflect the fact that they did not discuss all existing tests in their main background text, only selected, common tests.

3) Abstract Background: The specific focus on bipedal stance is not mentioned here, which could lead readers to believe that COP measures from many different standing balance tests will be of interest. I suggest mentioning this.

4) Abstract Method line 40: Change "synthetized" to "synthesized".

5) Abstract Discussion: computerised posturography is mentioned for the first time here. I suggest keeping terminology consistent with the previous sections of the abstract to avoid confusion.

6) Background paragraph 1 line 8: I suggest including a reference to support this statement.

7) Background paragraph 1 lines 15-25: The tests included in this description should be specified at the outset. It should be clear for readers to which tests precisely these limitations apply.

8) Page 6 line 5: I suggest not making a new paragraph here as the information directly follows from the previous sentence.

9) Page 6 line 10: change "stances" to "stance"

10) Page 6 lines 20-23: As mentioned above, the study of Piirtola and Era (2006) appears to have addressed this question before. Perhaps the authors can be more specific about the differences between the previous review and the current one.
Page 6 lines 23-27 "the main purpose of this systematic review is to extract the best biomarkers from a person's COP displacement results to quantify their future risk of falling". As described in the general comments, if the aim is looking at future risk of falls, I am not sure it is appropriate to include studies with retrospective falls assessment in the meta-analysis.

Page 8 Lines 35-40: Will the authors also consider the reliability of the various COP measures reported in the literature? E.g. Lin et al. 2008 Gait Posture 28(2):337-42. Doi: 10.1016/j.gaitpost.2008.01.005

Page 10 lines 34-48: The authors may also consider using software to extract values from graphs when raw data is not available. See, for example: https://automeris.io/WebPlotDigitizer/

General comments on the discussion: The authors may consider the reliability of various COP measures as mentioned above. Additionally, a potential limitation could be a lack of information about the situation that led to the falls in the included studies. Not all falls will be related to insufficient balance control or may have mechanisms unrelated to COP during standing, which will weaken the overall ability of COP measures to predict falls in general. When data is available, a sub analysis of type of fall may be of use.

Table 1: Population: "Older Adult", Intervention: "Stance", Comparison: "posturography" are terms that I would have expected in the search terms. Are these covered by the current search strategy?

Table 2: Participants criteria: "without neurological disease": Should this be determined by self report or by a diagnostic assessment?

Table 3: As mentioned above, justification of the intervention criteria would be helpful in the background of the main text.

Table 3: Equipment criteria: One could expect very different levels of data quality/reliability between, for example, force plates and pressure insoles. Perhaps the authors wish to mention how they would deal with or analyse the results from studies using such different methodology?

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