Reviewer's report

Title: Balance Mediates the Association Between Executive Function and Fall Risk in Older Adults

Version: 1 Date: 25 July 2011

Reviewer: Manuel Montero-Odasso

Reviewer's report:

General
This study examines an important and relevant topic to the readers of the BMC. Overall, the findings are interesting although not novel since prospective associations between cognitive impairment, executive function, gait and balance function and falls have been described previously.

The aim of this study is to investigate global and domain-specific cognitive function as a risk factor for falls in a cohort of community-dwelling, non-demented older adults using a prospective assessment of falls. One hundred and eighty nine participants from the community were included and they have had a baseline and one follow up assessment during 13 months of follow-up.

During follow up 34.4% reported at least one fall. Univariate analysis showed that fallers were more likely to have lower baseline scores in executive function. In the model adjusted for age, sex, and balance there was a non-significant trend toward higher scores on executive function tests being protective for falls. However, in an additional analysis the risk of falling among participants with no or minimal balance impairment was significantly related to executive function (OR 0.44; 95% CI 0.23, 0.89). The authors conclude that lower scores on executive function tests are a risk factor for falls in participants with minimal balance impairment and that this effect was not found in participants with poor balance.

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Major Compulsory Revisions

1. The manuscript could be benefit from focuses on the primary question of this study. For example: A) Is the primary question to evaluate if balance mediates the association between executive function and falls, as it is expressed in the title? Or, is the primary question to know if executive function mediated risk of falls independently of balance performance?

2. The design of the study should be clearly stated in the Methods Section. Please, clarify if this study is a secondary analysis of exiting data.

3. Since this study is about the relationship between cognitive function, balance and risk of falls, it is important to know the history of previous falls of the participants included. It is well known that previous falls and fear of falling are among the most important predictors of future falls; therefore, these variables
should be included in any study addressing risk of falls. If this information is not available in the present study, please add a sentence noting this limitation.

4. It is not clear how balance impairment is defined. The authors have used the Performed Oriented Mobility Assessment (POMA) to evaluate balance and gait in their participants. The POMA consists in a specific balance and gait clinical evaluation developed by Tinetti and coworkers and, in general, it is accepted that a POMA score below 20 (maximum score achievable is 28- higher scores represent better function) places the participant in a high risk of falls category. Since the authors used a cut off of 2 or higher as balance impairment, it is not clear for this reviewer how the POMA has been operationalized and scored in this study.

5. Please provide additonal clarification about the scoring system in the cognitive testing. Table 1 provides values for each cognitive test; however, they seem to be z-scores. Having the raw scores for each cognitive test will provide to the reader a more clearly clinical picture of the population evaluated. Additionally, it will also make the results of this research comparable with previous studies. Therefore, I believe that the rationale of using z-scores vs raw scores in the descriptive statistics should be provided.

6. Analysis,
The analysis need to be adjusted for history of previous falls.

7. Discussion
The statement in page 14 , line 1 “These findings support the development of cognitive training interventions that focus on improving executive function through developing skills such as dual tasking for the prevention of falls” is not supported by the results presented in this article.

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Minor Essential Revisions

1. It would be helpful to include a narrative description of the POMA and the range of the possible scores.

2. Please, comment about the finding presente in table 1 that the gait velocity of both groups is below 1 m/s placing them at high risk of falls.

3. Please, provide key words.

4. Baseline information about history of fall is missing in table 1.

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

**Quality of written English:** Acceptable

**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