Author’s response to reviews

Title: Age independency of mobility decrease assessed using the Locomotive Syndrome Risk Test in elderly with disability: a cross-sectional study

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Response to the Comments of Editor

First of all, through the process of revision, we have come to a conclusion that the initial naming to our test was redundant and have change it to “Locomotive Syndrome Risk Test” from “Short Test Battery for Locomotive Syndrome”.

From the editor :In particular, please explain your approach to investigating the Locomotive Syndrome in the wider international context of studies of mobility limitation in older people.

> To assess mobility impairment, we believe it is essential to quantify lower extremity mobility (noted on page 15, line 266). Our approach to investigating Locomotive Syndrome using the Locomotive Syndrome Risk Test enables to quantify the mobility decrease in a feasible way, even for those who are disabled. In addition, owing to its simplicity and feasibility, this test can serve as a screening tool for middle-aged or older people, which could in turn help us assess mobility decreases at the population level. Thus, our approach to investigate Locomotive Syndrome will be generalizable a broad population.

We have added a sentence to clarify our approach for mobility decrease in the background (page 5, line 85)

"This test is expected to be a useful screening tool for detecting mobility decrease in middle-aged and elderly adults because of its simplicity and feasibility."
In addition to the response to the reviewers’ comments, we have corrected several typos in Table 3d. Furthermore, We’ve checked the paper again and made a few edits throughout to improve the clarity of the text. We have double-checked the formatting as well. All corrections in the revised manuscript are marked in colored text (yellow: the response to the reviewers’ comments, green: others).

Response to the Comments of Reviewer #1 (Gerd Ahlström, Ph.D.)

We found your comments on our manuscript very helpful. We have revised the manuscript in accordance with your comments, and have responded to your comments as follows:

1. How can the control group be considered as having health when they were selected in connection with a medical check-up at a medical center?

   >We have changed “healthy individuals” to “independent community dwellers” to clarify their characteristics. We changed all relevant parts of our manuscript to reflect this (page 3, line 49 and others).

2. The authors need to describe how the examination was conducted, which resulted in no specific movement disorders among the persons in the healthy group? Which data is this based on? Who or how many done the examination? The authors need to explain this in detail.

   >We have added a sentence to specify how and by whom they were evaluated (page 7, line 109). "These visitors were evaluated by physiotherapists or physicians through general medical examination, such as visual inspection and medical interview; in this study, we included only those subjects without apparent mobility limitation."

3. Which criteria have been used in the selection of the relatively small group of elderly with disability (n = 135) compared with a relatively large group of "healthy individuals" (n = 1,469). Has power analysis been made before decision of the size of the study groups? Are these groups convenience sampling?

   >The sample size of 135 is the result of consecutive sampling. In terms of feasibility, we prioritized collecting a sufficiently large sample of community-dwelling elderly with disability for multivariate analysis as we expected the collection of data would be relatively difficult considering the population. Therefore, independent community dwellers were recruited during the same observation period in parallel, leading to the relatively large sample size. As our primary analysis is based on an interaction analysis (to illustrate the difference in age coefficients between the certified elderly group and the independent community dweller group), we did not conduct a formal power analysis or sample size calculation. Based on these points, we have added a comment in the discussion (page 16, line 279). "Third, there is potential selection bias in the independent community dwellers because they were recruited from people who visited a medical center for a periodic medical check-up."
4. The authors do not report about the diagnoses or sociodemographic characteristics in the study groups. Could it be that the care need in the elderly group do not depend on the nature of the disease? Several other reason may exists and need to be investigated. One example could be elderly who live alone and who do not have relatives that can take care of them. This example means that one confounder can be whether they have significant others who is informal caregivers or not. Investigation of the characteristics of the two study groups is necessary in order to draw valid conclusions from the results and to answer the aim of the study.

> The Japanese LTCI (long-term care insurance) certification and the various related care levels reflects the patients’ status well because they are based on the nationally standardized score of an 82-item, interviewer-administered questionnaire assessing ADLs, mental status, and medical activities, combined with their primary care physician's opinion (noted in page 7, line 126). This is supported by a past study indicating that LTCI care level was well correlated with the Barthel Index (noted in page 7, line 122). However, as you mentioned, other cofounders are likely to affect mobility impairment. Therefore, we have revised a comment in the discussion (page 16, line 274).

"Second, our data did not include other possible factors influencing mobility, such as presence of severe complications, recent hospitalizations, or socioeconomic status (e.g. marital status, occupation, and living alone or not). Further investigation will be needed to conclusively determine the effects of age and mobility decrease on elderly with disability."

5. During how long time was the retrospective observation ongoing?

> We have added the duration (2012–2016) (page 6, line 104).

6. The author need to clarify the reason of interaction test between the "healthy group" and elderly group. Background to this statistic analysis should be better explained in the study.

> We have clarified the reason for the interaction, and the background of the statistical methods (page 10, line 172).

"We further examined the differences in the coefficients of independent community dwellers and the elderly with disability via an interaction test, to determine whether the effects of age/sex on the test scores differed between these two groups. In the model we included the main effects of age, sex, and group (independent community dwellers vs. the elderly with disability), as well as the age- and sex- product terms with group. We further adjusted for support and care level in the certified elderly group. P-values for the product terms measure the differences between the coefficients in the certified elderly and independent community dwellers (i.e., p-values for interaction tests)."

We hope that the revised manuscript is suitable for publication in BMC Geriatrics.

Response to the Comments of Reviewer #2 (Soham Snih)
We found your comments on our manuscript most helpful. We have revised the manuscript in accordance with your comments, and responded to the comments as follows:

1. Title, comment: Since this study is of cross-sectional design, the word "decline" is not the appropriate one. The participants are not been observed for decline.

   >We changed the word “decline” to “decrease,” as the reviewer noted (page 1, line 1 and others).

2. Abstract, comments: The objective is somehow not very clear. The Short Test Battery are tests that assess lower extremity function. Measuring them at one time gives information on how well or bad an individual does. With a cross-sectional design study, we only can say that the scores are high or decreases with age but not decline.

   >We have revised “mobility decline” to “mobility decrease” to clarify the objective, as the reviewer pointed out (page 3 line 49, and others).

3. Introduction, comment: The objective need to be more clear.

   >We clarified the objective (page 6, line 94).

   "Thus, the purpose of the present study is to examine whether mobility decrease in already disabled elderly adults is age-dependent, using the Locomotive Syndrome Risk Test to quantify the mobility decrease."

4. Methods, comments: Please provide the score range for the two-step test in this section.

   >The score of the two-step test indicates the maximum gait speed, as it is calculated with the following formula: length of the two steps (cm) ÷ the subject's height (cm). Therefore, a particular range among this test does not exist.

5. Results, comments: It will be informative if findings presented in Table 4 for healthy individuals are presented for disabled subjects too.

   >We initially considered presenting the findings on disabled elderly in the form of a table. However, we believe this may mislead readers to incorrectly understand the presented values as standard values for disabled elderly at each age and would like to present Table 4 exclusively with healthy individuals.

6. Discussion, comment: One of the study limitations is the cross-sectional design to study decline. This need to be acknowledge in this section.

   >We have revised the sentence in the discussion (page 16, line 272).

   "First, this is a cross-sectional study of rather few elderly with disability. Thus, further large-scale longitudinal studies will be needed to make any conclusions on age-independency in elderly with disability."
7. Minor comment: The words "decline", "decrease" and "deterioration" are used interchangeable throughout the manuscript. Please be consistent. Probably the most appropriate word is "decrease" or "poorer performance".

We have unified “decline,” “decrease,” and “deterioration” as “decrease” throughout the manuscript.

We hope that the revised manuscript would be suitable for publication in BMC Geriatrics.