Reviewer’s report

Title: Accelerometer-determined physical activity and self-reported health in a population of older adults (65-85 years): a cross-sectional study.

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Reviewer: Richard Pulsford

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This article describes the differences in a number of physical activity related outcomes across age and gender groups, and also associations between physical activity level and self-reported general health in a novel population (Norwegian older adults). The findings provide potentially useful insight and could be helpful in the targeting of future physical activity interventions. This paper has merit although there are a number of issues which I feel should be attended too. I enclose my comments and suggestions below.

Major Compulsory Revisions

1. The analyses require some clarification. Paragraph 3 of the statistical analysis section refers to univariate analyses but then adds that test centre, age, BMI and self-reported health were treated as confounders. No further mention is made of adjustment for these confounders although tables 2 and 3 state that analyses were adjusted for test centre. It is necessary to clarify which of these potential confounders were adjusted for in each set of the analyses (clearly age would not have been included in the age group analyses).

2. I am concerned that the possible effects of differences in accelerometer wear time have not been considered, as this is not reported. Failure to account for such differences can lead to a number of problems with the interpretation of the data. Minimum wear time for inclusion was 10 hrs although it seems unlikely that a 10 hr period would capture all waking time in this population, meaning that some activity (before they put the monitor on, after they took it off and before the went to bed or at other points during the day for i.e. before or after water based activities) will not have been measured. It is reported that wear time (mean 14 SD 1.2hrs) within the sample was variable but it is not clear whether wear time varied significantly between age groups or between genders. Without knowing this it is possible that the observed differences in physical activity may simply reflect differences in wear time between groups. For example the statistically significant (23 minute) difference in sedentary time between men and women in the youngest age group could possibly be due to men wearing the monitor for a longer period (i.e. having more measured behaviour) than women, rather than a true difference in sedentary behaviour. This is also particularly important when considering the percentage of wear time spent at different activity intensities or overall daily counts per minute as these values are a functions of daily wear time.
Two people could record 60 minutes of sedentary behaviour but if one wore the accelerometer for 10 hrs and one wore it for 15 hrs their percentage sedentary time would be different (10% vs #7%) even though the absolute values are the same.

One way to address this would be to formally test for between group differences in accelerometer wear time. Another way would be to adjust the between group analysis for wear time (minutes/per day).

3. The tables require further information and clarification. The study reports significant differences between age groups in overall physical activity level (counts per minute) and in steps per day although no significant differences are reported in table 2. These are only described in the text. Table 3 highlights the differences between sex within age groups but does not report the between age group differences (again these are only described in the text). The foot notes in the tables should describe any covariates included in the model, as described above it is not clear what has been included. Tables 2 and 3 report 95% confidence intervals differently. An example from table 2 is ‘-25-52’ while in table 3 these are reported as ‘-42.9 to -3.3’. These should be consistent. I would suggest using the format in table 3, as when reported as in table 2 it is unclear whether the upper limit of the confidence interval is positive or negative (and therefore whether the 95% CI includes zero).

4. Are all participants retired from full or part-time employment? This is not clear from the methods section (though in the discussion [paragraph 8] it describes a period ‘following retirement to 85yrs’). Comparisons are made across age groups using data from individuals with at least 4 days of accelerometer wear. Physical activity is then averaged across these days. If some of these participants (most likely those in the youngest age group) are still employed then the number of working/non-working days included in the will affect their computed average activity levels.

For example, if their occupation involves walking or any physical work and their physical activity measurement period includes only working days then their measured activity level may be higher than someone whose measurement period includes non-working days (where they may be less active). This may be a possible contributor to the finding that younger people have a higher activity level. It is therefore necessary to clarify whether any of the participants were employed or whether they were all retired (and therefore this study only considers leisure-time activity).

5. Did the final sample of 560 who were included in the analysis differ from 628 who provided informed consent (in terms of age, gender, education level, BMI and perceived health)? Drop out analysis is mentioned very briefly in the discussion (paragraph 11) where it states that ‘responses varied according to sociodemographic variables’ although it is unclear which sociodemographic variables are being referred to and how they differed between those included and those not included in the analysis. As these factors may influence physical activity and sedentary behaviours it is important to test and report this. This should be reported at the beginning of the results section and the discussion
section could include further comment on how the inclusion criteria (4 valid days at 10 hrs) might have influenced the findings.

Minor Essential Revisions
6. In paragraph 5 of the methods section (‘other variables’) the explanation of the computation of BMI is missing a few words. Presumably it should read ‘body mass (kg) divided by height in meters squared’.

7. In paragraph 3 of the results section we are directed to table 3 for description of analyses of sex differences in steps per day. These are actually in table 2.

8. In general I feel that there are a number of sections where paragraph and sentence structure require attention as they are a bit muddled and unclear. An example is paragraph 9 in the discussion section: ‘Of the few studies available, a study mentioned above targeting community dwelling people in the UK from 65 yrs and older’. There are also quite a few typographical and grammatical errors. I would suggest that it is important that the authors go through the manuscript thoroughly in order to address these and improve the paper’s readability.

Discretionary Revisions
9. In the methods section I feel it would be of benefit to add to the description of the difference between low-intensity and lifestyle physical activities. Examples are given for lifestyle activity although none are given for low intensity activity. It seems that these are defined purely by accelerometer defined activity intensity rather than using any descriptive or contextual information on the actual activity. It would be useful to clarify what sort of activities might be considered low intensity as opposed to lifestyle activities and why you decided to examine these separately instead of using ‘light intensity activity’ (i.e. all activity between sedentary and moderate intensity).

10. Was the self-reported perceived health scale condensed from 5 categories to 4? Very good and good are separate categories while poor/very poor are combined. I can assume by looking at the tables that this may have been due to low numbers in the ‘poor’ and ‘very poor’ groups although if this is the case it should be explained in the methods section.

11. In the Statistical analysis section it is stated that Pearsons chi-square analyses were used to identify differences between the sexes in PA recommendations. Do you mean in the proportion of people from each sex who adhered to the current physical activity recommendations? This needs to be clearer.

12. Paragraph 1 of the results section reports physical characteristics of the study sample. This information is repeated in table 1 and is not necessary in the text as well. This paragraph also details the most frequently reported diseases and conditions and most frequently reported activities. I am not sure what this information adds to the paper and feel that it could be removed. It is not included in the analyses and doesn't seem very relevant to the two main research
questions which were to describe accelerometer defined physical activity and to investigate associations between overall physical activity level and self-reported general health.

13. I don’t feel that the description of table 2 in the results section (‘the PA variables are presented in table 2’) is sufficient. It should describe which outcome variables are presented and how (i.e. across sex and age categories).

14. I feel that the results section needs be more coherent. There are a range of results to describe and therefore it is important that they are in a clear and logical order. Perhaps the use of subheadings to make a clear separation between description of results from each outcome measure may be of benefit. I think describing the results in a consistent order would also help. In paragraph one (overall PA level) age group analysis is presented before gender analysis and then in paragraph 2 (steps per day) the gender analysis is described first. Also, in paragraph 4 no mention is made of any gender differences in adherence to physical activity recommendations although these are noted in the table.

15. In paragraph 2 of the results section I would suggest adding to the two sentences describing the age by gender analysis of sedentary time and low-intensity PA so it is clearer which figures refer to which groups. There is also no mention in this section of any (or the absence of) significant between group differences in lifestyle physical activity.

16. Paragraph 1 of the discussion section only refers to overall physical activity level and general health analysis. I’d suggest that this paragraph briefly summarises all of the principle findings including the between group differences in intensity specific physical activity.

17. Paragraph 3 of the discussion section refers to ‘light intensity activities’ which have previously been described as either low intensity or lifestyle activities. This should be consistent throughout.

18. Paragraph 4 of the discussion section could do with reordering slightly for better flow. It begins to make a point about health consequences of sedentary behaviour then moves on to interventions, then returns to health consequences of sedentary behaviour.

19. Paragraph 6 of the discussion section (relating to the steps per day analysis) is too brief. It states that these results are in accordance with some other studies but does not give any details of their findings or possible differences in the age groups examined or methodologies used. Are the findings exactly the same? Is the magnitude of the difference the same? In the same age groups? Using the same methodology?

20. Paragraph 9 of the discussion section compares the findings with a study examining associations between steps per day and self-reported health. It seems strange to compare the present findings relating to PA level (in cpm), with those from a previous study examining steps per day, when steps per day were also
measured here. Was this association examined?

21. In any study using accelerometers to define physical activity the use of minimum wear time criteria is a limitation as it can lead to some measureable activity not being included in the analyses. Examining a 10 hr period (the minimum in this case) of a person’s day by definition excludes all time outside of this period (and as described previously it seems unlikely that 10 hrs represents all waking hrs in this population). As certain behaviours may be more likely to occur at certain times of the day (for example people may be more likely to engage in sedentary behaviours before they go to bed) the start and finish time of their measurement period will affect which behaviours are captured. Without 24 hour measurement this is very difficult to account for but should be acknowledged as a limitation.

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

**Quality of written English:** Needs some language corrections before being published

**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 interest