Reviewer's report

Title: Socioeconomic status and work, travel, and recreation related physical activity in Japanese adults: a cross-sectional study

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Reviewer: Heini Wennman

Reviewer's report:

1. There is a concern about the novelty and scientific contribution of the current study. The associations between socioeconomic status and physical activity have been quite extensively studied, at least in Europe and Western countries, as also the authors have acknowledged. They further state that their study is the first to examine these associations in Japan, and therefore have important contribution to our knowledge about the subject. However, there are to my best knowledge also other studies (e.g. Inoue et al. 2011. J.Epidemiol. 21 (6) 481-90; Kondo et al. 2009. Environ Health Prev Med 14 (3): 196-206; Murakami et al. 2011. Soc Sci Med 73 (12): 1683-8; Fukuda et al. 2005. BMC Pub Helath. 5:53;), in addition to some of those cited by the authors, that have studied the associations between socioeconomic status and physical activity in Japan. The findings of the current study should be discussed more detailed in the light of these previous findings. The authors are therefore kindly asked to specify what is the novelty and scientific importance of the current study and to discuss their findings in relation to previous findings in Japan.

2. The assessment of physical activity leaves many unanswered questions to the reader. I would expect a little more detailed description about the use of the GPAQ v2. The GPAQ is not that widely used to assess physical activity, different to what the authors claim. The GPAQ is a version of the International Physical Activity Questionnaire (the IPAQ), constructed to be used in developing countries. Why was the GPAQ chosen as the questionnaire instead of e.g. the more widely used IPAQ? Further, were the participants classified as active and inactive according to the median in different domains of physical activity? There is a discrepancy regarding this and the results in table 1, as the median refers to the 50% limit and in the table 1 the percentages for active and inactive groups are not 50-50%. Perhaps the authors have used the mean but mistakenly written median? However, to my best knowledge, the GPAQ provides information about days and duration of physical activity so why is not a continuous variable of physical activity for each domain utilized? Continuous data would provide more valuable information about the amounts and differences in amount of physical activity for different socioeconomic groups. Also, the classifications of individuals
with respect to their total activity is said to be done according to WHO recommendations. In that case, the classification should take into account also those meeting the vigorous intensity level or the combination of moderate and vigorous. Now the individuals are only classified as active based on the moderate intensity recommendation of 150 minutes/week.

3. The use of terminology in the manuscript is confusing and not following common terms e.g. regarding physical activity. There is variation in which terms are used, e.g. both “marriage status” and “marital status” occur, and also inaccurate wording such as “physical activity associated with work” has been used. The authors are asked to revise the manuscript for the consistency and correct use of terms throughout the text. Regarding the physical activity terminology, I would suggest the authors to choose either the terms “occupational”, “commuting” and “leisure time physical activity” or “work-related”, “travel-related” and “recreational physical activity”.

4. There are some issues regarding the data sampling and data handling that need to be clarified. First of all, what year was the data collected? From what area or areas of Japan were the respondents? What was the representativeness of the final sample compared to the general population in Japan? Of the 8284 selected persons, 39.5% responded and 57 further had missing data. This leaves 3215 participants according to my calculations, but the authors report the number of subjects to be 3264. Where does this discrepancy come from?

5. Measurements and data analysis. I am confused whether the statistical analyses included only logistic regression or also linear regression modelling? Now both are mentioned but the results are only presented for the binary logistic models. The measures of SES that have been used are very simple (educational level and household income) and the variable “household income” is perhaps not the most informative. Could it have been possible to calculate a more detailed variable for income that take into account the household size and number of children, such as e.g. “the Household income by consumption unit”, as recommended by the OECD. And why was not employment controlled for in the analyses? Employment status is crucial for both occupational and commuting physical activity, and also impacts the income level of the person, so that working part-time results in a lower income level than working full time. As the authors themselves discuss, the reason for a lack of significant associations between SES and occupational physical activity in women in this study can be due to the fact that 70% of the women were not working. If a person is not working, and spends his or her time mostly at home, there is likely less commuting physical activity. The authors state in their discussion that “the reasons why the indicators of SES that are associated with travel physical activity are different in men and women in this study is unknown”, but perhaps employment would be one reason? Saito et al. 2013. Int J Environ Res Pub Health 10(5) has reported on an association between working status and recreational and transportation walking among middle-age and older Japanese men and women.

Minor Essential Revisions
The Abstract and Methods:
- Should “material status” be marital status?
- Are the ages presented as mean ± standard deviation or standard error?

The Abstract and Results:
- Unnecessary duplication in the first sentence: “over” and “#”
- The term association/associate is used confusingly for describing domains of physical activity in the same sentence with results from the logistic regression models. Consider the use of terms such as “occupational physical activity”, “commuting physical activity” and “leisure time physical activity” or equivalent.
- The first sentence starts with “Men” and ends with “in men”. Please remove the other.

The Abstract and Keywords:
- Physical activity is not usually used as “activities”. Please correct.

Background:
- paragraph 1: Rather specify “inactive” as “physically inactive”. The term inactive has a wider meaning referring to all sorts of activity such as social and cultural activity.
- paragraph 2: “determinant factor” should be either “determinant of” or “determining factor of”
- paragraph 2: “PAD domains”, should be either “PAD of work, travel and recreation” or “domains of work, travel and recreation”.
- paragraph 2: the last sentence need to be checked for the reference
- paragraph 3: I do not understand the message in the sentence” There is some evidence from Japan for and against…, with additional findings regarding the associations between SES and physical activity.” Can you please write what you mean by the additional information about SES and physical activity?

Methods:
- Measurements, paragraph 1: please correct “three separate SES domains (work, travel, recreational)” to only “domains”
- Measurements, paragraph 1: please give a reference to the statement that the definition of sedentary behavior is consistent with the literature.
- Measurements, paragraph 1: at the end of the last sentence, please leave out “which is”
- Measurements, paragraph 2: please give a reference to the statement that GPAQ is validated and widely used
Measurements, paragraph 3: it is said that the demographic variables are obtained from the research company, according to the International Physical Activity Questionnaire Environmental Module. What is this module and how was it used? Please specify how the demographic variables were obtained.

Measurements, paragraph 3: please specify the classification of income levels. As it is now, it is not clear where those with an income of 7 million yen belong, to the category 3-7 million or the category #7 million?

Data analysis, paragraph 4: please correct “marriage status” to “marital status”. See major comments for the comment on the use of terminology.

Results:

paragraph 1: please consider the way to report the background characteristics. Now the paragraph is very hard to read because of so much numbers. It is suggested that more parentheses are used and maybe the information can be reduced since the same is also presented in table 1.

paragraph 1: Household income has been mentioned twice in the list of proportions. The latter should be replaced by “educational level”.

paragraph 1: Where does the information about body mass index or weight and height come from? Presumably this is also self-reported information but this is not stated in the methods.

Discussion:

paragraph 1: please correct the following sentence: “the present study found that the associated between SES and physical activity…”

paragraph 2: there cannot be a “negative association”, please correct and use “inverse”

paragraph 3: please revise the sentence beginning with “Ishii et al. (2010) and Inoue et al. (2010) reported that…” The sentence is too long and complicated and could be cut after “Japanese subjects”.

paragraph 3: please revise and do not use “positive association” but “direct association”

paragraph 3: It is not clear if the conclusion about the environmental effect on the association between SES and commuting physical activity refers to the current findings or previous literature. If it refers to the current study the claim is not supported by the analyses, but is rather a speculation based on previous findings in the literature and should be stated as one.

paragraph 4: please the sentence “Leslie et al. reported that high SES residents had more access to parks than lower SES residents and used them more”

paragraph 5: please insert “for” after “compensated”
-paragraph 6: please specify that education measures SES in the sentence “Education is a frequently used indicator in epidemiology”

-Paragraph 6: please give a reference to the sentence: “Formal education is strongly determined by parental characteristics.”

-paragraph 6: please correct: “each SES indicator with each PAD” to better describe the current setting and results. Suggestion: “of the two SES indicators with the different physical activity domains.”

-paragraph 7: Please give a reference to the sentence “However, GPAQ has been standardized and is used worldwide.”

Conclusion:

-paragraph 1: It would be more appropriate to write the conclusions in the same way that the results are given, i.e. higher SES was associated with less work-related physical activity etc.

-paragraph 1: it is not correct to draw the conclusion that SES was associated with total physical activity since this association was seen only for men regarding the highest income level (#7 million yen) and it is also questionable to draw the conclusion for recreational physical activity since only income level (the highest) was associated with higher physical activity

References:
-please fulfill the reference nr 29, Lehto et al.

Discretionary Revisions

The Abstract:
- Keywords: I am not sure whether “Health Status Disparities” is an appropriate keyword for this study

References:
- The style of the reference list should follow the style recommended by the journal

All manuscript:
- The text is partly centered and partly aligned to left resulting in an unfinished look

Level of interest: An article of insufficient interest to warrant publication in a scientific/medical journal

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 interests.