Author's response to reviews

Title: Association of self-reported physical activity patterns and socio-demographic factors among normal-weight and overweight Japanese men

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Author's response to reviews: see over
Dear BMC Public Health Section Editors:

Thank you for reviewing our manuscript. I would like to resubmit the attached manuscript entitled “Association of self-reported physical activity patterns and socio-demographic factors among normal-weight and overweight Japanese men,” for consideration for publication as a research article in the *BMC Public Health*.

The manuscript has been revised in accordance with the reviewers’ comments. The suggestions provided have been incorporated in the revised manuscript.

Reviewer 1

We greatly appreciate your comments. In accordance with your suggestions, we have revised the manuscript as described below:

Major Compulsory Revisions (2):

**[Reviewer's comment 1]** What are the hypotheses and underlying mechanism in this study? Why did authors think the socio-demographic correlates of physical activity differed by weight status? There is no exact description. In addition, there is no exact detail or example about strategies and intervention approach those could be induced by the result of this study. I think this point is essential for readers to assess the impact of this paper to the public health field.

**Answer 1**: Thank you very much for your comments. First, we have added a description relating to the hypotheses and the underlying mechanism of examining socio-demographic correlates of physical activity (PA) by weight status in this study (page 4, lines 1–8):

Regarding overweight and obese populations, some studies observed that the PA patterns differed according to weight status [12,13,14]. Similarly, a study conducted on Brazilian adults indicated that socio-demographic variables (e.g., sex and education) associated with self-reported PA seem to differ between normal-weight and overweight or obese adults [15]. The study suggested that this was due to overweight and obese individuals having different motivations or preferences with respect to PA participation compared with normal-weight people.

In addition, we have included more precise details about strategies and intervention
Based on the findings of the present study, encouraging overweight men to engage in walking could be considered a gateway for them to achieve health-enhancing levels of PA. More factors associated with walking or other specific MVPA behaviors need to be further identified to develop tailored PA for overweight men. In addition, for normal-weight men, the promotion of daily walking (e.g., walking for transportation or recreation) should target unmarried individuals and those with a lower household income, while men with full-time employment should be encouraged to engage in MVPA (e.g., leisure-time PA, sports, and vigorous types of recreational activities) in their leisure time.

[Reviewer’s comment 2] Did authors calculate the statistical power of each subgroup analysis (normal-weight and overweight)? Please discuss and conclude carefully the difference between normal-weight and overweight. The presented differences in significance of correlates might just reflect the differences in statistical power to detect weak to moderate associations between normal weight (n=979) and overweight (n=441) men. It seems unreasonable to interpret that “associated correlates in overweight men were different from those in normal-weight men” (P.10-11).

Answer 2: Thank you very much for this constructive comment. To bolster the study design, we conducted additional interaction tests between BMI status and each socio-demographic variable for PA using binary logistic regression models; these results are presented in a new table (Table 3). A significant interaction was observed between BMI status and household income for two PA outcome variables ($p = 0.004$ for total PA; $p = 0.02$ for walking). Thus, as well as adding Table 3, we have made the following change (page 9, lines 1–6):

**Significance of interactions between BMI status and socio-demographic variables**

Regarding total PA and walking, a significant interaction was observed between BMI status and household income ($p = 0.004$ for total PA; $p = 0.02$ for walking) (Table 3). Therefore, subgroup analyses for the associations between socio-demographic correlates and PA were conducted among normal-weight and overweight men.

We have also discussed the results of the interaction tests (page 12, line 20 to page 13, line 10):

In logistic regression models, the interactions between BMI and five socio-demographic
variables (age, marital status, educational level, job status, and household income) separately for the three PA outcome variables were tested based on likelihood ratio tests. Only household income was revealed as a different socio-demographic correlate of PA between normal-weight and overweight men. Consistent with the findings of a Brazilian study [13], we did not observe an interaction between BMI and age. In contrast, an interaction between BMI and education, which was identified in that study [13], was not observed in the present study. In addition, previous studies have indicated that the adults with a higher household income were more likely to be physically active [9,10]. However, there has been no discussion or analysis as to whether this association differs according to BMI status. A possible mechanism underlying the observed significance in household income only among normal-weight men is that household income may not be a barrier or facilitator for overweight men to engage in walking compared with normal-weight men. Therefore, the findings of the present study suggest that correlates of specific PA may vary according to BMI status.

Based on the results of the interaction test, we concluded that “associated correlates in overweight men were different from those in normal-weight men” (page 11, line 4 to page 12, line 1).

Minor Essential Revisions (4):

[Reviewer’s comment 3] Table 1.
“SD = standard deviation” to Table 2.

Answer 3: Thank you very much for this additional revision and those below. We have moved “SD = standard deviation” from Table 1 to Table 2.

Change from “Furthermore” to “However.”

Answer 4: We have revised the text as follows (page 8, lines 7–9):

However, significant differences were observed in the mean time spent engaged in MVPA ($p=0.001$) and in the proportion attaining 150 minutes of MVPA ($p=0.035$) between normal-weight and overweight men.

[Reviewer’s comment 5] P. 9
Please correct the usage of conjunction.
**Answer 5:** We have corrected the usage as follows (page 10, lines 12–14):

Table 4 also shows that normal-weight men not in full-time employment were more likely to engage in 150 minutes of MVPA (OR = 2.61; 95% CI = 1.55–4.37) than those in full-time employment.

[Reviewer’s comment 6] P. 13 L.13 (Author’s contributions)
Correct “.”

**Answer 6:** We have corrected “.” into “.”, (page 15)

**Reviewer 2**

Thank you most kindly for your comments, for which we are most sincerely grateful. In accordance with your suggestions, we have revised the manuscript as indicated below.

**Major Compulsory Revisions (4):**

[Reviewer’s comment 1] Authors should make a better case for the study. In fact, it is unclear whether findings from any country could be generalizable, and data from the cited Brazilian study is not representative of Brazilian population. From the ecological perspective, every place could offer an excellent research opportunity, so what is the real contribution of the present study, since explores only few (important of course!) factors within the ecological approach

**Answer 1:** Thank you very much for this comment. We are sorry for not having properly explained our case. The main purpose of our study was not to examine whether the results of the Brazilian study would apply to our own. In the light of your comments, we have made the following revisions (page 4, lines 9–23):

The importance of further identifying how patterns of PA and socio-demographic characteristics differ according to BMI status was highlighted in these previous studies in order to emphasize the effect of PA intervention for overweight and obese adults [12,13,14,15]. However, to date few studies have examined PA patterns and associated socio-demographic factors stratified by BMI status. Substantial evidence on this issue is necessary for intervention designers and policy makers, especially in Asia, which has
faced a growing obesity epidemic in recent years. In addition, previous studies have compared only the time spent in PA of different intensities (e.g., moderate-, vigorous-, or moderate- to vigorous-intensity activities) between normal and overweight or obese individuals \[12,13,14\]. However, few studies have described and compared the behavioral domains (e.g., walking, other type of PA) between normal and overweight or obese people. The aim of the present study was to determine whether there should be a focus on a particular domain of PA behavior and also whether special consideration should be given to individuals most in need of intervention when designing effective PA programs for overweight Japanese men.

[Reviewer’s comment 2] Another issue of concern is about the results that show that overweight men were significantly less likely to achieve 150 minutes of MVPA than normal-weight men and spent less time in MVPA per week. This is not a new finding and my question goes to the reasons why authors did not explored the information about sedentary time, since the IPAQ provide it?

Answer 2: Thank you very much for your comments. As you note, a growing number of recent studies have found that sedentary behavior is associated with overweight, independent of physical activity (Clark et al., 2009). However, in our study, we focused on encouraging overweight men to engage in sufficient physical activity to enhance their health. Therefore, the outcome variable was only physical activity in our analysis.

In addition, although our results also show that overweight men were significantly less likely to achieve 150 minutes of MVPA than normal-weight men and spent less time in MVPA per week, the total PA in our study was stratified into walking and other types of MVPA. Therefore, in contrast to the findings of previous studies, our results suggest that owing to their poor physical condition, it may be more difficult for overweight men to engage in MVPA (e.g., leisure-time PA, sports, and vigorous types of recreational activities) rather than walking. We discuss these results in the Discussion section (page 12, lines 4–19).

<Reference>

Some of the socio-demographic factors do not appear to be related to PA on overweight or obese subjects. Do the authors consider psychosocial or environmental correlates in the study design? Previous available studies have already pointed out the importance of including different levels of correlates when investigating PA behaviors.

Answer 3: Thank you very much for your comments. As noted in the introduction, promoting overweight men to engage in sufficient PA has become a public health issue in Japan. Therefore, within a behavioral epidemiology framework (Sallis et al., 2000), the present study was designed to provide a better understanding of several important personal and socio-economic factors associated with self-reported PA among overweight men. As the next step, following Sallis et al. (2000), we aim to identify the multiple correlates of PA of an associated population. Thus, only socio-demographic factors associated with PA were examined in the present study.

In addition, although some socio-demographic factors do not appear to be related to PA in overweight or obese subjects, the likelihood ratio tests were conducted to compare models with or without interaction terms between socio-demographic variables and BMI status for PA outcome variables. A significant interaction regarding PA was observed between BMI status and household income (Table 3). Based on this finding, we have reported and discussed this new finding as follows (page 9, lines 1–6):

Significance of interactions between BMI status and socio-demographic variables

Regarding total PA and walking, a significant interaction was observed between BMI status and household income (p = 0.004 for total PA; p = 0.02 for walking) (Table 3). Therefore, subgroup analyses for the associations between socio-demographic correlates and PA were conducted among normal-weight and overweight men.

We have also addressed this point in the Discussion (page 12, line 20 to page 13, line 10): section.

In logistic regression models, the interactions between BMI and five socio-demographic variables (age, marital status, educational level, job status, and household income) separately for the three PA outcome variables were tested based on likelihood ratio tests. Only household income was revealed as a different socio-demographic correlate of PA between normal-weight and overweight men. Consistent with the findings of a Brazilian study [13], we did not observe an interaction between BMI and age. In contrast, an interaction between BMI and education, which was identified in that study
[13], was not observed in the present study. In addition, previous studies have indicated that the adults with a higher household income were more likely to be physically active [9,10]. However, there has been no discussion or analysis as to whether this association differs according to BMI status. A possible mechanism underlying the observed significance in household income only among normal-weight men is that household income may not be a barrier or facilitator for overweight men to engage in walking compared with normal-weight men. Therefore, the findings of the present study suggest that correlates of specific PA may vary according to BMI status.

<Reference>


[Reviewer’s comment 4] It is very clear that authors recognized some limitations in the present study, but it would be also important to improve the recognition of the study strengths. The last sentence on the discussion is indistinct, such kid of implications in developing effective PA promotion strategies need to be better elucidated.

Answer 4: Thank you very much for this comment. In the light of your comment, we have amended the text as follows (page 14, lines 19–24):

Despite these considerations, the present study has some strengths. This study has a large sample size (n=1,420) and specifically focused on a sex subgroup with a higher prevalence of overweight (men). In addition, except for educational level, the distribution of age, marital status, job status, household income, prevalence of overweight, and attaining the total PA recommendations was similar to that for the general Japanese population [4,27,28].

We have also more clearly elucidated the implications from the results of this study in the last section of the Discussion (page 14, line 24 to page 15, line 3).

Therefore, the findings of the current study could provide important implications in that the patterns and socio-demographic correlates of self-reported PA differed between normal-weight and overweight men. Future studies are needed to further identify correlates of PA by different BMI status in developing tailored PA intervention for the
overweight population.

We very much hope that you find these adjustments satisfactory and that the revised version will be acceptable for publication in *BMC Public Health*.

Sincerely yours,

Yung Liao