Author’s response to reviews

Title: Physical Activity and Sedentary Behavior among Chinese Children aged 6–17 years: A Cross-Sectional Analysis of 2010-2012 China National Nutrition and Health Survey

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Author’s response to reviews:

Dear Dr. Priya Vart,

I am really appreciated your managing my manuscript and the valuable comments from the reviewers. I revised manuscript according the comments in MS word by using the track changes and also listed the response for each comment as the follows. Please feel free to contact me if there's any further query. Thank you very much.

Best regards.

Chao Song

Response to the comments of reviewer 1 (S Prafulla, MPH):

1. Methods: The author had explained that a standard questionnaire has been used to collect the required data. The study subjects were children aged 6-17 yrs old. How the data has been extracted from the kids with the younger age?
Response: “For the children younger than 10 years old, questionnaires were completed with the assistance of their parents or their main caregivers.” has been added in the revised manuscript (Line 129-130).

2. It was explained in the methodology that different types of physical activity have been considered. But what will be the recall period for this data? Is this data for past 24-hours or past one week?
Response: The recall period was the past semester, which has been added (Line 128).

3. It was not clear in the methodology that the duration of physical activity was assessed with the only questionnaire or have you used any monitor to assess the duration of physical activity?
Response: The duration of PA was assessed by the questionnaire which has been described in line127-128, and we did not use any other monitor which has been discussed as the limitation of the study.

4. Statistical analysis: The various intensity of physical activity has been mentioned in the result section. Hence I suggest the author to detail the steps to classify the intensity of physical activity.
Response: In the section of methods, the various intensity of PA has been described (Line137-138). We only collected the total time of moderate-vigorous physical activity (MVPA) and vigorous physical activity (VPA), so in the result section, the status of MVPA and VPA were analysed.

Response to the comments of reviewer 2(Rosliza Abdul Manaf, PhD):

1. The examples of physical activities programmes conducted in China
Response: The examples of physical activities programmes conducted in China have been added in the discussion (Line315-316) as the follows “In China, the government have made some regulations and taken some actions. For example, school sanitary regulation issued by Ministry of Education and National Health Commission in 1990 and sun sports programme launched in 2007.”.
2. What do you mean by "proxy reports" in page 11, line 256. It was not elaborated either under the methodology.

Response: “For the children younger than 10 years old, questionnaire was completed with the assistance of their parents or their main caregivers.” has been explained in the section of methods (line129-130). So here I described the data were collected through self- or proxy-reports.

3. What is the implication of the study findings to the current policy/programme on physical activities among children in China?

Response: The implication of the study findings was: Although Chinese government have made some regulations and taken some actions, the current study indicated the level of PA among children and adolescents was still far from optimistic, especially leisure-time PA, as well as time of sedentary behaviours. The reason might due to the current policy mainly aimed at school-time PA, rather than the each domain of PA and sedentary behaviours. The transportation PA, leisure-time PA and domestic PA are also important components of PA and good to the development and health of children, and on the contrast, sedentary behaviour is an independent risk factor. So the attention should be also paid outside the school, and the supportive environments such as the community and the family should be established. The content has been added in the discussion (line314-324).

Response to the comments of reviewer 3(AbubakrAbdelraoufAlfadl, Ph.D.):

1. SPECIFIC METHOD Survey using questionnaires is a worrying method in such studies. Asking children to recall time (in minutes) spent in a specific type of physical activity is challenging. If this added to the possibility of a social desirability bias, which could be argued is inherent in all surveys that concern adopting socially undesirable behaviors, validity and reliability of study will be questioned. Although this mentioned in the limitation of this study, but it is hard to be overlooked.

Response: It's truly that there's recall bias for the questionnaire method, especially in children. However, the questionnaire is still a feasible and valid method for the large scale survey, considering the cost, the burden on the subjects, etc., and is being used by other studies, such as National Health and Nutrition Examination Survey’s (NHANES) National Youth Fitness Survey (NNYFS) of US.
2. Physical activity and sedentary behaviors ac 1/ Page 5, line 108; replace the term 'et al' by the term 'etc.'

Response: The term 'et al' has been replaced to ‘etc’(line132).

3. Statistical analysis The most thing worrying me with this paper is the absence of inferential analysis for most of the studied variables (variables presented in table 2). All differences and similarities presented in results and discussion sections between studied variables (gender, age groups, locations) are difficult to be assumed of real meaning without knowing whether those differences are statistically significant or not. Authors need to run inferential analysis for these variable and thereafter present differences and similarities. Presentation of this information will, significantly, improve the paper and increase its value.

Response: P value has been added in the tables and the results.

4. RESULTS I think it is better to highlight the significant results while other are already presented in the Tables.

Response: The description of the results has been simplified.

5. Transportation PA Page 7, line 154; add unit to the number 38.5±0.83, may be minute.

Response: The unit “min/d” has been added (line187).

6. DISCUSSION Page 9, lines 201 and 202; it is mentioned that "Compared to girls, boys spent more time doing school-time PA". Do that difference between boys and girls in time spent doing school-time PA statistically significant? This is necessary to infer something from this difference. As with results section, I prefer to highlight significant differences. In line 201 and 202, I mentioned the difference between boys and girls in time spent doing school-time PA, and the difference was statistically significant.

Response: P value (0.0093) has been added in the table2, and compared to girls, boys spent more time doing school-time PA, and the difference was statistically significant. In section of the discussion, the description has been also revised ”boys spent more time doing school-time PA in comparison with girls”(line253).
Response to the comments of reviewer 4 (Walaa Fattah Al-Chetachi, Ph.D):

1. **Background:** Page 3, Line 53 of the article please insert the WHO reference related to the definition of PA at the end of the sentence.

   **Response:** The reference of the PA definition has been inserted in line 67.

2. **Line 53-56:** the sentence "Engaging in regular PA can reduce the risk of hypertension, coronary heart disease, stroke, diabetes and some types of cancer (breast cancer, colon cancer), are fundamental to energy balance, weight control and emotion" [10, 11], need to be either paraphrased or split into 2 sentences to be more clear.

   **Response:** As suggested by the editor, the background was shortened and focus on the children. So I deleted this sentence.

3. **Line 63** please add the word "performing or doing" before homework while sitting

   **Response:** As suggested by the editor, the background was shortened and the definition of sedentary behaviors has been deleted.

4. **Line 73:** please write down full name and add the abbreviation between two brackets of "China National Nutrition and Health Survey (CNNHS)" because this is first time mentioned in the text.

   **Response:** The full name "China National Nutrition and Health Survey" has been added in line 86.

5. **Methods:** is sound and well explained Page 5; **line 108:** what did the authors mean by et al at the end of this sentence in the methods."School-time PA included physical education class, exercise during class breaks, et al"

   **Response:** The 'et al' has been replaced to ‘etc’ (line 132). School-time PA included all the exercises conducted in school, such as education class, exercise during class breaks and other time.
6. Authors didn't mention about the estimated sample size or the total number of students targeted to participate in the survey however they mentioned only that data of 38744 students were analysed. So what is the response rate of this survey is it 100% that all students approached, agreed to participate and included in the sample.

Response: In the section of Sampling method and implementation, the sampling size has been described.

The estimated sample size was 36000 children aged 6-17 years and a multi-stage stratified cluster random sampling method was used in CNNHS. A total of 150 sites were selected, among which 34 were big cities, 41 were medium and small cities, 45 were ordinary rural areas, and 30 were poor rural areas. In each site, six villages or communities were randomly selected, and in each village or community, 75 households were randomly selected.

The children aged 6–17 years in each family were involved in this survey. If the number of children in each age group was less than 20(the number of boys and girls was equal), some children would be selected from nearby primary schools to meet the minimum sample size. Finally, a total of 38,744 children aged 6–17 years involved and all of them completed the survey.

7. Statistical analysis Page 5, Line 125: please add the word "and" before areas in the sentence "The participants were divided into sub-classes according to their gender, age group, areas."

Response: The word "and" has been added in line 154.

8. Results: is clearly presented Page 7, line 143:

the sentence "Children in rural areas stayed in school longer than that in urban areas" to be changed into "Children in rural areas stayed in school longer than those in urban areas"

Response: The sentence has been deleted when I shortened the results as the editor suggested (line 175).

9. Line 145, I think the word "most" should be replaced by "more"

Response: The sentence has been deleted when I shortened the results as the editor suggested (line 179).
10. Page 8, Line 178, replace the word "and" in the sentence "and children in the poor' with the word "where" to be (where children in the poor--)

Response: As suggested by the editor, I simplified the section of results, and some sentences have been deleted including this one.

11. I think it would be better if the authors described their results according to the sequences of results' tables, so all results parts related to table 2 should be first and then table 3. Thus Leisure-time PA part of the results would be the last part of the results.

Or the authors can split table 2 so data related to Leisure-time PA and sedentary behavior collected in one table which is table 3 and in the text it would be the last part of the results describing the Leisure-time PA and sedentary behavior.

Response: The results were modified according to the sequences of results of tables and placed leisure-time PA part to the last part of the results (Line236-244).

12. Discussion: Page 9, line 208: it is better to replace "compared to" by "in comparison with"

Response: The word "compared to" has been replaced by "in comparison with" (line 253).

13. Line 215-219: the sentence "The data indicated that Chinese children were physically inactive in their leisure time, and the similar problem existed in many other countries: as described by Hallal, and has been found among students aged 13-15 in the Association of Southeast Asian Nations (ASEAN) member states, in Portuguese healthy children and adolescents aged 10-18 years, and in Scottish adolescents[35-38]" First the authors mentioned Hallal without et al and the year of study. So it should be Halaletal 2012. Also in the references part the order no. of Hallal et al reference is 37 however it is mentioned in the discussion text before the reference of Association of Southeast Asian Nations (ASEAN) member states and Portuguese studies. So I think the authors should review the numbering of all references in the reference list and their references should be listed according to its sequences in the text.

Response: The sequences of the references has been checked and listed according to its sequences in the text.
14. Conclusion: Line 262: the word "and" after 1st sentence should be deleted and added before the last sentence in the line 264. Our data suggested that about half of Chinese children did an hour school-time PA, and only one in three children participated leisure-time PA, two in three children went to school by active transport, about seventy percent children did domestic PA. It should be "Our data suggested that about half of Chinese children did an hour school-time PA, only one in three children participated leisure-time PA, two in three children went to school by active transport, and about seventy percent children did domestic PA.

Response: The place of “and” has been changed according to the reviewer’s comments (line 329).

15. Line 265: the word "engaged" should be deleted and use the word "spent"

Response: The word “engaged” has been replaced by “spent” in line 330.

16. References: References needs to be revised Reference No. 10 "Physical activity [http://www.who.int/mediacentre/factsheets/fs385/en/]

Response: The references No. 10, No. 24 and No. 42 have been revised in the right way.

Response to the comments of reviewer 5(EmanAlhalal, PhD):

1. The topic is very important and I am sure it adds to the knowledge related to Chinese culture because it is using a national health data. However, I am concerned that the data is from 2010 to 2012, and we might have different aspects of physical activity in 2019? There is a study by Zhu et al., 2017 entitled "Prevalence of physical fitness in Chinese school-aged children: Findings from the 2016 Physical Activity and Fitness in China-The Youth Study" which used data in 2016 to look to school-aged children physical activity.

Response: The data was from 2010-2012 CNNHS which is a nationally representative cross-sectional study and conducted every 10 years (before 2010)/five years(since 2010). The latest survey period was 2015-2017, but the data is still in cleaning. So the data used in our study was the latest data available.

As for the study by Zhu et al., the title was "2016 Physical Activity and Fitness in China—The Youth Study", in which only the whole time of moderate and vigorous PA per day was
collected. In our study, the different domains of PA were all collected and the PA patterns can be described more thoroughly.

2. Abstract: the result section is too long and it needs to be shortening with important results only

Response: The result section of abstract has been shortened.

3. Background: the background is well explained. In line 54, "Engaging in regular PA can reduce the risk of hypertension, coronary heart disease, stroke, diabetes and some types of cancer (breast cancer, colon cancer), are fundamental to energy balance, weight control and emotion" are these consequences occur in childhood or adulthood?

Response: Regular and adequate levels of physical activity have many benefits at all ages, but these consequences occur in adulthood. As suggested by the editor, the background was shortened and focus on the children. So it was deleted in the revised version.

4. The sentence has grammatical issue The aim "The study was to describe.." it has grammar problem.

Response: The sentence has been revised as “The purpose of the study was to describe” in line93.

5. "provide basic information to aid in developing PA intervention strategies" how the author achieved this aim?

Response :The section has been added in the discussion in line 314-324 as the follows “Although Chinese government have made some regulations and taken some actions, the current study indicated the level of PA among children and adolescents was still far from optimistic, especially leisure-time PA, as well as time of sedentary behaviours. The reason might due to the current policy mainly aimed at school-time PA, rather than the each domain of PA and sedentary behaviours. The transportation PA, leisure-time PA and domestic PA are also important components of PA and good to the development and health of children., and on the contrast, sedentary behaviour is an independent risk factor. So the attention should be also paid outside the school, and the supportive environments such as the community and the family should be established.”.
6. **Method:** The PA was assessed with school-time PA, transportation PA, leisure-time PA and domestic PA. However, the question is what is the scale that was used to assess these categories. What its reliability and validity? It also says that "Leisure-time sedentary behaviors included…doing homework in leisure time". Does homework consider children leisure time?

Response: The World Health Organization (WHO) defined PA as any bodily movement produced by skeletal muscles that required energy expenditure, including activities undertaken while working, playing, carrying out household chores, travelling, and engaging in recreational pursuits. So according to this definition, PA was assessed by school-time PA, transportation PA, leisure-time PA and domestic PA. To children, PA while working means school-time PA. Transportation PA means PA while commuting from home to school. Leisure-time PA means PA done out of school. Domestic PA means household chores.

In the study, leisure time meant the time out of school, so leisure-time sedentary behaviours included doing homework.

7. **In line 107, "School-time PA included physical education class, exercise during class breaks, et al." et al. is not appropriate. Since the author considered school time PA, were there differences between public and private schools?**

Response: For Chinese Children, their PA at school usually includes physical education class, exercise during class breaks as demanded by the government for both public and private school to ensure one hour exercise per day at school.

8. **Under the analysis, "using two-sided tests" it is not clear which type of test. Did the author use t-test?**

Response: In the section of statistical analysis, the description has been revised. T-tests were used to compare the difference between gender and age group for continuous variables.

9. **Result:** "Children in medium and small cities spent most time on school-time PA (64.8 min/day), followed by poor rural areas (61.6 min/day), big cities (60.2 min/day), and ordinary rural areas" how the authors classified the cities as rural, big, and small? 147 poor rural areas (61.6 min/day), big cities (60.2 min/day), and ordinary rural areas (58.0 min/day).
Response: In our study, the four areas were classified according to economy and social development. Big cities were the central urban areas of big cities including municipalities, 6 designated cities and capital cities (population more than one million). Medium and small cities were downtown areas that excluded the big cities. Poor rural areas were the key poor counties identified by China. Ordinary rural areas were all the rest counties outside the poor rural areas. The classification of the area was described in section of methodology (Line 107-112).

10. Under the Leisure-time sedentary behavior, it is not clear how much time the children spend on watching television, using computers, playing video games.

Response: Our study didn't collect the time on watching television, using computers, playing video games separately and only the total time on all sedentary behaviors was collected. The explanation was added in section of method (line 150-151).

11. In line 185, "In the four different areas, the amount of sedentary time and the proportion both presented a descending trend from big cities to poor rural areas". How there are differences?

Response: The description of the difference has been revised to “The older children and the children in big cities spent more time on leisure-time sedentary behavior compared with their counterparts.” (line 222-224).

12. Since the data is coming from larger study, the author can perform more analysis by looking to a relationship between PA with something else such as family socioeconomic status.

Response: It's a good suggestion. We are drafting a paper on the influence factor of the PA pattern by multiple regression model, including educational level, family income, and also the inter-action between PA and sedentary behaviors. Considering of the length of the current paper, we didn't analyse more detailed.

13. Discussion: It shows the explanation of the findings. However, the discussion lacks of explanation how these findings can be utilized to change the current situations in China.

Response: The explanation has been added in the discussion in line 314-324 as the follows "Although Chinese government have made some regulations and taken some actions, the current study indicating the level of PA among children and adolescents was still far from optimistic, especially leisure-time PA, as well as time of sedentary behaviours. The reason might due to the current policy mainly aimed at school-time PA, rather than the each domain of PA and sedentary behaviours. The transportation PA, leisure-time PA and domestic PA are also important components of PA and good to the development and health of children, and on the contrast,
sedentary behaviour is an independent risk factor. So the attention should be also paid outside the school, and the supportive environments such as the community and the family should be established.”.

Response to the comments of reviewer 6(Priya Vart):

1. Introduction: Please limit the focus of Introduction to China. Information on global levels of physical activity/sedentary behaviors, definition of physical activity/sedentary behaviors, their relationship with health can be avoided.

Response :The introduction has been shortened as suggested.

2. Methods: Please specify who answered questionnaire for children, especially those 6-10 years old.

Line 103-104, how children provided consent? Did 6 year old children signed and provided consent? What is the legal age of informed consent in China? Please reformulate.

Response :In the section of method, “A interview-administered questionnaire which conducted at child’s home or school by trained investigators was used to collect the PA and sedentary behaviors in the past semester. For the children younger than 10 years old, questionnaires were completed with the assistance of their parents or their main caregivers.” has been added(Line127-130). For older children, they finished the questionnaires themselves when interviewed.

In our study, Chinese children aged 6–17 years were our participants, and they were persons with no capacity or with limited capacity according to Chinese laws. So we must obtain the signed consent forms from the children’s parents or legal guardians before data collection.

3. Meaning is unclear of sentence in line 119-121. Please reformulate.

Response :MVPA and VPA has been reformulated in line 137-138. We only collected the total time of moderate-to-vigorous PA (MVPA) with the duration exceeding 10 min each time) and VPA total time (exceeding 20 min each time).
4. In Statistical analysis section mention what measure of variability was used for continuous variables (standard deviation or standard error). Were all continuous variables normally distributed? What statistical test was use to compare proportions?

Response: The method has been added in the section of statistical analysis (line 153-164).

For continuous variables in table 2, data were described as mean±SE (standard error). The survey weights calculated by National population census data from 2009, strata, and complexly sampling were used in the calculations, thus providing nationally representative estimates. PROC SURVEYMEANS were used to calculate means, and PROC SURVEYREG was used to compare the subgroup difference of school-time PA, transportation PA, domestic PA, leisure-time sedentary behaviors.

For continuous variables in table 3, data were described as mean±SD (standard deviation). Because these continuous variables were the data on leisure-time PA, and not all children participated leisure-time PA. So we only analyzed the children who participated leisure-time PA. When comparing the difference among subgroups of the continuous variables, tests of normality were firstly done. T tests were used to compare means between different gender and age groups. Group comparisons between different areas were performed using PROC GLM.

PROC SURVEYFREQ procedures in SAS were used to calculate proportions and 95% confidence Intervals (95% CIs), and to compare the subgroup difference of the proportion of variables about school-time PA, transportation PA, domestic PA, leisure-time sedentary behaviors and the proportion of leisure-time PA participation.

5. Results: Please do not repeated what is already mentioned in Tables. When mentioning higher/ lower (more more/less) (e.g. line 145), please mention p-values for the difference.

Response: The results have been shortened and p-values have been added in the description of the results.

6. Discussion: There are a number of ambiguous statements thoughts discussion (including abstract). Avoid ambiguous statements (e.g. line 196: "... achieved good results." Specify what were those good results).

Response: The ambiguous statements in the section of abstract and discussion have been modified (e.g. line 247-248).
7. In line 145 it is stated that "Older children spent more time doing school-time PA (62.8 vs. 60.6 min)." This can be statistically significant difference but from policy prospective is this a meaningful difference? There needs to be discussion on this in the manuscript.

Response: We checked the table, and the difference was not significant by statistically test. So in the results, the sentence has been deleted (Line178). Sorry for the fault.

8. When main aim is to assess differences by age, sex and area then why conclusion do not provide information on this aim?

Response: In the section of conclusion, the differences by age, sex and areas have been added(line330-334) as the follows “Boys were more active to participate in PA than girls, while girls spent more time on domestic PA and homework. Older children and children in rural area were more likely to take active transportation compared with their counterpart, and older children and children in urban area spent more time on sedentary behaviors”.

9. Add a paragraph on potential public health/policy implication of study results.

Response: A paragraph has been added to describe the implication(line314-324) as the follows “In China, the government have made some regulations and taken some actions. For example, school sanitary regulation issued by Ministry of Education and National Health Commission in 1990 and sun sports programme launched in 2007. The current study indicated the level of PA among children and adolescents was still far from optimistic, especially leisure-time PA, as well as time of sedentary behaviors. The reason might due to the current policy mainly aimed at school-time PA, rather than the each domain of PA and sedentary behaviors. The transportation PA, leisure-time PA and domestic PA are also important components of PA and good to the development and health of children, and on the contrast, sedentary behavior is an independent risk factor. So the attention should be also paid outside the school, and the supportive environments such as the community and the family should be established.”.