Author's response to reviews

Title: Is central obesity associated with health and health related quality of life in primary school children? Cross-sectional results from the Baden-Wuerttemberg Study

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Author's response to reviews: see over
We would like to thank the reviewers for their helpful comments and suggestions. We have tried to respond to all questions and to improve some aspects of our manuscript.

Referee 1:

2. Are the methods appropriate and well described?

The authors admit to the limitations of cross-sectional data. Please verify that all data are baseline and collected before the health promotion intervention began. If any data were collected after program implementation, please discuss in the limitations how this may bias the findings. Please detail every variable in the methods, including gestational information, birth weight, parental health habits, etc.

Changes made in the manuscript:

Methods – “Komm mit in das gesunde Boot- Grundschule “ (Join the Healthy Boat – Primary School), page 4

Only schools who did not participate in the programme yet were included.

Methods – Participants and Data, page 4

Baseline measurements of height and weight as well as WC were taken prior to the start of the intervention from 1944 children, the parental questionnaire was available from 1714 participants.

Statement of the authors:

All variables are described now in subsections of: Demographics, Health Behaviors, Anthropometric Measurements, Health and Health related Quality of Life.
3. Are the data sound?

Yes. However, many data are missing. I suggest the authors test for differences in independent and outcome variables by missing data. I also suggest the authors only use participants with complete data in the analyses. It is difficult to interpret the findings when there are different sample sizes for each variable and each analysis.

Statement of the authors:

Missing data analyses included.

Data and missing data are reported according to the STROBE Statement\(^1\): “Indicate number of participants with missing data for each variable of interest.” Subsequent analysis was performed on the basis of intention-to-treat.

To include only participants without missing data, the number of records would decline to 328 instead of 1888 (baseline characteristics) or 1331 (logistic regression), which would mean an immense loss of information.

Changes made in the manuscript:

Methods – Missing Data, page 4
Results – Missing Data, page 7/8

5. Are the discussion and conclusions well balanced and adequately supported by the data?

The discussion begins with results that were not reported and were not the primary focus – i.e. comparison of obesity prevalence to prior reference groups, differences in obesity prevalence between 1st versus 2nd grade students, and parental BMI and WHtR status. I suggest focusing on the major research question.

Statement of the authors:

Obesity prevalence was reported in table 1, “Total” column. Reference groups were used to define overweight and obesity (Methods – Anthropometric Measurements).

Discussion – Critical Interpretation and Meaning, page 8

Parts with results that were not reported were removed.

6. Are limitations of the work clearly stated?

The first paragraph of the limitations section contains extraneous information and should be condensed to state that the sample is not a representative sample of Germany. In the second paragraph, the authors claim that these are exploratory findings due to the cross-sectional nature of the study, and yet establishing correlational relationships and exploring factors associated with central obesity using logistic regression are not exploratory.

Statement of the authors:
The first paragraph includes the strengths of the study.

Changes made in the manuscript:

Discussion – Strengths and Limitations, page 11

Strengths are explicitly addressed now. “Exploratory findings” removed.

7. Do the authors clearly acknowledge any work upon which they are building, both published and unpublished?

A reference is provided for the full protocol, yet it is unclear what other manuscripts (if any) have been published on this study. The title indicates that these are the first cross-sectional results published from this study, which is likely why the overall means and details concerning the study are included. However, these detract from the major purpose of this article. I suggest the authors omit the “overall” column from the tables and omit the figures, as these do not substantially contribute to the findings of the present paper.

Statement of the authors:

In the meantime, another article has been published (“Interaction of sedentary behaviour, sports participation and fitness with weight status in elementary school children”).
This manuscript is the first one dealing with HRQoL and central obesity.

Changes made in the manuscript:

Title

Is central obesity associated with health and health related quality of life in primary school children? Cross-sectional results from the Baden-Württemberg Study

Figure 1 Weight distribution in the study population was removed.

Table 1 and 2 “Total” columns were removed.

8. Do the title and abstract accurately convey what has been found?

The abstract should define the location of data collection (city/state/country). The methods in the abstract should state that these are baseline cross-sectional data. The results section in the abstract should state the direction of difference (e.g., centrally obese children had more sick days).

Statement of the authors:

Location of the data: State and country were added, a city can not be defined because the data were not collected in one city but in many places spread all over the entire state of Baden-Württemberg.

Changes made in the manuscript:

Abstract – Background
State and Country added.

Abstract – Methods
“Baseline measurements” added.

Abstract – Results
Direction of differences added.
9. Is the writing acceptable?

The writing would benefit from a thorough editing of grammar and style.

Statement of the authors:

The revised manuscript has been edited by two of the authors who have lived in the USA and UK for several years.

- Major Compulsory Revisions

1. Background: The first paragraph of the background is not essential and could be condensed to 1-2 opening sentences.

Changes made in the manuscript:

Background, page 2

First paragraph was shortened.

2. Statistical analysis: The statistical analysis should be conducted on the dataset containing complete data, with no missing data. Otherwise it is difficult to interpret findings given different sample sizes for each analysis.

Statement of the authors:

Data and missing data are reported according to the STROBE Statement: “Indicate number of participants with missing data for each variable of interest.” Subsequent analysis was performed on the basis of intention-to-treat.

When including only participants without missing data the number of records would decline to 328 instead of 1888 (baseline characteristics) or 1331 (logistic regression), which would mean an immense loss of information.

3. Statistical analysis: Unadjusted odds ratios to predict central obesity should be accompanied by adjusted odds ratios, using a logistic regression that controls for each covariate. Clarify the major independent variables versus the covariates, and identify these in the results and tables. It appears the authors used stepwise regression in predict likelihood of high sick days – please specify this in the methods,
results, and tables, and state whether it was forward or backward stepwise regression. I suggest using this technique for predicting central obesity as well.

Statement of the authors:

Predicting central obesity was not a major research question of this study, another publication is planned on this topic.

Statistical analysis in the method section is now subdivided into the main research questions (Differences between WHtR Groups, Analysis of Differences in Health related Quality of Life, Analysis of Absenteeism)

Changes made in the manuscript:

Methods – Statistical Analysis – Analysis of Absenteeism, page 7

Stepwise backward elimination was added.

Results – Odds Ratios from Stepwise Logistic Regression Analysis for Higher Level of Child Absenteeism, page 8 / 9

Stepwise backward elimination was added.

Results Table 1

Unadjusted odds ratios were removed.

4. Statistical analysis: Given the large age range (5-10 years) in the 1st and 2nd grade, I imagine some of the older children had mental, physical, or socio-emotional troubles. Were this data collected? If so, use this as a covariate. If not, address this in the limitations. What are other potential confounders that were not controlled for in the analysis? Please address in limitations.

Statement of the authors:

Only five children are older than 9 years and since children in Germany can start school at an age between 5 and 7, a 9 year old pupil in the second grade is not that extraordinary. There are no noticeable problems revealed by the variables in the dataset concerning these children. There were no mental or physical illnesses reported by their parents.
The variety of variables used for regression analysis is very broad and covers almost every aspect of the children’s environment. No further variable with a significant contribution could be identified.

Changes made in the manuscript:

Results – Baseline Characteristics, page 7

Average age of the examined children in first and second grade was 7.1 ± 0.6 years, ranging from 5.4 -9.8 years, 51.2% were boys.

5. Results: The authors have combined baseline characteristics with study analysis in the results section and in Table 1. I suggest reporting these separately in both the results and the table. The 2nd and 3rd paragraph of the results are simply reiterating what is already reported in the table, so this can be deleted from the text.

Changes made in the manuscript:

Results – Table 1

Statistical significance and crude odds ratios were removed. Significant differences between groups are now reported separately in the text. Reiterating was removed from the text.

Results – Table 2

Statistical significance were removed. Significant differences between groups are now reported separately in the text. Reiterating was removed from the text.

6. Results: Specify the direction for the results on HRQoL – which group was higher or lower?

Changes made in the manuscript:

Results – Health Related Quality of Life, page 8

HRQoL measured by EQ VAS was significantly lower in children with higher WHtR ($p = 0.010$). These differences were also found in the KINDLR subscales "school" ($p = 0.038$) and "friends" ($p = 0.029$). However, the KINDLR total score did not show lower values in children with central obesity.
7. Results: The authors omitted parental weight status from the logistic regression of student absenteeism to avoid multicollinearity, yet the reported correlations are weak. I suggest including these covariates since they are only weakly related to child central obesity. Also, “weight status” should refer to actual weight not to central obesity. Please use consistent terms.

Statement of the authors:

The logistic regression analysis including parental weight status results in the same model, only replacing maternal health consciousness with paternal overweight. The authors assume that maternal health consciousness is a better explanatory variable because of it’s more direct relationship with children’s sick days rather than paternal overweight.

Changes made in the manuscript:

Results - Odds Ratios from Stepwise Logistic Regression Analysis for Higher Level of Child Absenteeism, page 8 / 9

Parental weight status and WHtR were excluded to avoid collinearity with children’s weight status and WHtR on the one hand and to the favor of parental health consciousness as a more direct measure of health behavior.

8. Discussion: The first paragraph contains results not report in the results and not tested for significance. Please omit, or else build into the research question and results section with a link to the major research question. The first paragraph would benefit from additional references, including the relationship between WHtR and health risks. I am unclear how the last 3 sentences of the 1st paragraph relate to the paper or are justified by the present findings. The 2nd paragraph would benefit from a topic sentence describing the major findings, then discussing why focusing on modifiable behaviors is important.

Changes made in the manuscript:

Discussion – Critical Interpretation and Meaning, page 9 / 10

Statement of the authors:

Parts with results that were not reported were removed.

Additional references were added.
Results of the present study clarified in the last sentence of the first paragraph.

Paragraphs for the discussion of each result clearly delimited.

9. Conclusions: Wouldn’t health literacy and education need to focus on parents as well, given the young age of the targeted population? The “upwards spiral of weight gain” and the “vicious circle of obesity and lower education level” need further support from the present findings and other literature.

Statement of the authors:

Hint to the parents added. Upward spiral of weight gain was, with other words, referenced in the background section [7], first paragraph, and is now also referenced in the conclusion section. Reference added for the “vicious cycle of obesity and lower education level”. Present findings were also referenced.

Changes made in the manuscript:

Conclusion, page 12

10. Tables: I suggest only reporting percentages in Tables 1 and 2 and reducing the sample to those with complete data (providing comparisons on key variables for missing versus non-missing data). I don’t see the value of the “total” column. I suggest reporting unadjusted and adjusted odds ratios in a 2nd table, since these are the statistical findings and not baseline characteristics.

Statement of the authors:

Table 2 reports mean values and standard deviations which can not be represented by percentages.

Data and missing data are reported according to the STROBE Statement: “Indicate number of participants with missing data for each variable of interest.” Missing data analysis for key variables was added.

Changes made in the manuscript:

Table 1 and 2 “Total” columns were removed.

Table 1 crude odds ratios were removed
11. Figures: Omit the figures. This information is reported in the tables.

*Statement of the authors:*

The authors would prefer to keep the figures with the box plots (Figure 2 and 3) because the information given by these is neither reported in the tables nor in the text. A box plot aggregates all important information about a distribution such as outliers, range, quartiles, interquartile range, skewness, minimum, maximum and median.

*Changes made in the manuscript:*

Figure 1 was removed.

- Minor Essential Revisions -

1. Abstract – State the location of the study. Move the 1st sentence of the results to the methods section. Specify the direction of differences (e.g. children with central obesity had more sick days than those without central obesity, which group had lower KINDL sub-scores, etc).

*Changes made in the manuscript:*

Abstract – Background
State and country was added.

Abstract – Methods
Cross-Sectional Data from 1888 first and second grade children (7.1 ± 0.6 years) participating in the baseline measurements of the Baden-Württemberg Study were analyzed.

Abstract – Results
Direction of differences was added.

2. Background- Every time the word “significant” is used, the direction of association and the comparison groups should be stated. For instance, in paragraph 2, “.. overweight and obese children had higher but not significantly different total health care costs compared to normal weight children.” The statements regarding HRQoL need to be referenced (paragraph 4). Specify the age range for the samples in ref 18-
20. If including references on adult samples, make this clear as these have different implications for the present study compared to studies of children.

*Changes made in the manuscript:*

Background, page 2 / 3

Direction of association and comparison groups are now stated.

References regarding HRQoL were added.

Age range was added.

3. Methods- Specify the unit of measure for BMI. Write everything in past tense and omit helping verbs. Report the reliability and validity of KINDL and EQ VAS. Include every variable in the methods section – I notice that gestational information, parental health behaviors, sports participation, and others are not described in the methods.

*Statement of the authors:*

Reliability and validity of KINDL\textsuperscript{R} and EQ VAS are reported in the references (Erhart et al. 2007, Ravens-Sieberer et al. 2010).

All variables are described now in subsections of: Demographics, Health Behaviors, Anthropometric Measurements, Health and Health related Quality of Life.

*Changes made in the manuscript:*

Methods – Anthropometric Measurements, page 5

Children's BMI was calculated as weight divided by height squared (kg/m\textsuperscript{2})

4. Results: Why was HRQoL excluded from the logistic regression on child absenteeism?

*Statement of the authors:*

HRQoL itself may be influenced by sick days and so far is no independent variable. Thus, HRQoL is not a clear explanatory variable for higher rates of absenteeism. HRQoL was excluded from the logistic regression on child absenteeism because of this mutual relationship.
Changes made in the manuscript:

Results - Odds Ratios from Stepwise Logistic Regression Analysis for Higher Level of Child Absenteeism, page 8 / 9

All variables included in Table 1, except HRQoL because of its mutual relationship with the outcome variable, were tested for significant influence on child absenteeism in a logistic regression model using stepwise backward elimination.
Referee 2:

Major Compulsory Revisions

Title

1. I would suggest using the term abdominal obesity or central obesity in the title instead of abdominal fat accumulation. As the authors use central obesity a lot throughout the paper, I would suggest using the term central obesity instead.

Changes made in the manuscript:

Title

Is central obesity associated with health and health related quality of life in primary school children? Cross-sectional results from the Baden-Württemberg Study

2. Throughout the paper, different terms are used for central obesity. Please change this to the use of one term instead of using various terms as this is confusing for the reader.

Changes made in the manuscript:

Central obesity is now used consistently.

Abstract

3. Please specify in Methods section the statistical tests that are used for analyses.

Changes made in the manuscript:

Abstract - Methods

Mann-Whitney-U test was applied for statistical testing of differences between WHtR groups. Logistic regression models were calculated to identify factors associated with sick days.
4. Please specify in methods section the 2 groups that were used to analyze differences (the 2 WHtR groups) as this is not clear when only reading the abstract.

*Changes made in the manuscript:*

Abstract – Methods

Mann-Whitney-U test was applied for statistical testing of differences between WHtR groups.

5. Please specify the direction of the findings in the abstract under results.

*Changes made in the manuscript:*

Abstract - Results

Direction of the findings was now added.

6. In the conclusion of the abstract the authors state that parents tend to take off more days of work to take care of their child; however this finding was not significant in the current study.

*Changes made in the manuscript:*

Abstract – Conclusion

Statement was removed

7. The authors should carefully read the paper with help of a native English speaker to correct English grammar.

*Statement of the authors:*

The revised manuscript has been edited by two of the authors who have lived in the USA and UK for several years.
Introduction

8. To make the introduction somewhat stronger I would suggest that the authors shorten the section on obesity and its economic burden and describe in more detail what has been found in previous studies with relation to BMI/WHtR and absenteeism of children at school and parents at work, visits to physicians, QoL (and which subscales) etc.

Changes made in the manuscript:

Background, page 2 / 3

Section on obesity and its economic burden was shortened, more details were added to the other topics.

9. I suggest that the authors describe the health promotion program in a little more detail. For example, what are the behavioral and environmental measures that the authors are describing on page 4 first line? What does the program entail (in short)? Are both parents and teens involved? I would suggest addressing those topics.

Changes made in the manuscript:

Methods - "Komm mit in das gesunde Boot - Grundschule" (Join the Healthy Boat - Primary School, page 4

Health promotion program is now described in more detail.

Participants and data

10. I suggest to divide the Data section with subheadings for the different measures, foe example: Demographics; Health behaviors; Anthropometric measurements; Health related quality of life. With respect to the child’s and parent’s anthropometric measurements, describe them under the same heading (the two descriptions of measurements are in the current version of the paper not described subsequently).

Changes made in the manuscript:

Methods – Participants and Data, page 4 / 5

Subsections were added: Demographics, Health Behavior, Anthropometric Measurements, Health and Health related Quality of Life
Statistical analysis

11. Please describe to two subgroups in this section.

*Changes made in the manuscript:*

Methods – Statistical Analysis, page 6

Subsection “Differences between WHtR Groups” was added

Results

12. I suggest that the authors report in the text either p-values or OR’s for their significant findings as well as the direction of the finding. As there are many results described, this will improve the readability.

*Changes made in the manuscript:*

Results, page 7 / 8

Direction of findings are now added, p-values are reported in the text, OR’s were removed.

13. Please clarify for the reader why HRQoL was not tested in the logistic regression (page 7, line 1).

*Changes made in the manuscript:*

Results - Odds Ratios from Stepwise Logistic Regression Analysis for Higher Level of Child Absenteeism, page 8

All variables included in Table 1, except HRQoL because of its mutual relationship with the outcome variable, were tested for significant influence on child absenteeism in a logistic regression model using stepwise backward elimination.

Discussion

14. I suggest that the authors discuss the results not only in line with previous studies, but also as to why the authors think they found the current results.

*Changes made in the manuscript:*

Discussion, page 9 -11
Paragraphs for the discussion of each result are clearly delimited now.

Possible reasons for the current results from the view of the authors were added.

Minor Essential Revisions

15. The authors use influence in the title to describe the relations found in this study; however, given the statistical tests used in the study, one can only speak of association and correlation but not of influence.

*Changes made in the manuscript:*

**Title**

*Is central obesity associated with health and health related quality of life in primary school children? Cross-sectional results from the Baden-Württemberg Study*

**Introduction**

16. Please reword line 6-7 on page 3 of the Introduction.

*Changes made in the manuscript:*

**Background, page 3**

Only few authors have already addressed health related absence from school concerning overweight and obese children with heterogeneous conclusions.

17. Please break up the sentence in multiple sentences line 10-13 page 3.

*Changes made in the manuscript:*

**Background, page 3**

Sick days and illness are with regards to content directly linked to health related quality of life. Obesity in adults is associated with impaired health related quality of life (HRQoL) [14]. There is also some evidence that HRQoL in overweight and obese children is lower than in their normal weight peers, but differences are not always significant and seem to depend on the method of rating [15-17].
18. Move line 14-15 page 3 to the next paragraph.

*Changes made in the manuscript:*

Background, page 3

Line 14-15 page 3 was moved to the next paragraph

19. Please spell out all the abbreviations when used for the first time (such as WHtR on page 3 of introduction.

*Changes made in the manuscript:*

Abbreviations are spelled out now when used for the first time.

**Discretionary Revisions**

These are recommendations for improvement which the author can choose to ignore. For example clarifications, data that would be useful but not essential.

20. As I’m looking at the missing data, I’m wondering why the authors didn’t use Multiple imputation to fill in the missing values as they lose many cases in their analyses.

*Statement of the authors:*

Missing value imputation was considered. However, we refrained from imputing values because of the mixture of categorical, binary and continuous variables and the associated set of problems concerning limitations of current implementations and rounding strategies. We did not want to replace one bias by another.

A missing analysis was conducted and included in the manuscript.