Author's response to reviews

Title: Patterns in sedentary and exercise behavior and associations with overweight in 9-14-year-old boys and girls

Authors:

Saskia J te Velde (s.tevelde@erasusmc.nl)
Ilse de Bourdeaudhuij (ilse.debourdeaudhuij@ugent.be)
Inga Thorsdottir (ingathor@landspitali.is)
Mette Rasmussen (M.Rasmussen@pubhealth.ku.dk)
Maria Hagstromer (mahag@biosci.ki.se)
Knut-Inge Klepp (k.i.klepp@medisin.uio.no)
Johannes Brug (j.brug@erasusmc.nl)

Version: 3 Date: 22 December 2006

Author's response to reviews: see over
December 19, 2006

Dear Editor,

Thank you for your letter (dd December 1, 2006) informing us about the reviewers' comments and asking us to revise our manuscript and address the reviewers' comments.

With this letter, we would like to submit the revised version of our manuscript, accompanied with a detailed response to the concerns raised by the reviewers, which is included in this letter.

We believe that the revisions have improved our manuscript and hope that the manuscript can now be accepted for publication in BMC Public Health.

Sincerely yours,
On behalf of all authors,

Saskia te Velde, PhD
Response to reviewer #1, Jo Salmon

Comment
INTRODUCTION
1. Please make a stronger argument in the Introduction regarding the need to identify clusters of physical activity and sedentary behaviour, why this is important to do has not been made explicit (ie, what are the implications of identifying behavioural clusters?).

Response
We now added a stronger argument at page 3, stating that a combination of health behaviors may introduce a health risk that is greater than would be expected from the sum of the individual factors and that knowledge on associations between health-behavior patterns and overweight will provide insights for the development of multifactorial overweight preventive strategies.

Comment
METHODS
2. Sample, 2nd paragraph: “..no response differences according to age or educational level were found”. Please clarify if this is parental, maternal or paternal education.

Response
We apologize and clarified by adding ‘parental reported family educational level’

Comment
3. Measures, Behaviors, 1st paragraph: please identify the time frame for daily TV viewing and computer use, is this in a usual week/month..?

Response
The questions did not refer to a specific time frame, because we wanted to assess usual behavior. Therefore we just asked about usual TV viewing, PC use and physical exercise behavior. When referring to a specific time frame, results may be more biased by unusual situations (exams, holidays, illness), whereas asking about usual behavior, without a reference to a specific time frame, may be a more valid measure for habitual or usual behavior. However, we agree that we did not really analyze differences in results due to including or excluding a specific time frame in these questions. Our decision was based upon experiences with other measures.

Comment
4. Measures, Behaviors, 1st paragraph: Was there a rationale for the 3 hr/week cut-off for physical activity? Was this based on the distribution of the data? Several countries recommend children participate in at least one hour of moderate-to-vigorous intensity physical activity every day (eg, UK, US, Australia). What was the rationale for assessing vigorous-intensity exercise during leisure-time? This needs to be stated in the Methods or woven into the Introduction. For example, perhaps it was considered that vigorous-intensity PA is more likely to be related to weight status in children..? Or, was this measure based on previous ACSM recommendations for fitness (3 x 20-30 mins/wk in vigorous-intensity PA)?

Response
The presented study is part of the larger Pro Children study primarily investigating fruit and vegetable intake and determinants of intake among children and their parents across nine European countries. As part of this, other health behaviors were assessed, but only few questions could be dedicated to those topics. It was decided to include a brief physical activity and sedentary behavior questionnaire. A
question on moderate-to-vigorous-intensity physical exercise instead of total physical activity was included because it is generally accepted that activities of higher intensities help to enhance muscle strength and flexibility, and have other health benefits, which is especially relevant among children. Furthermore, the recommendation for more intensive physical activity for fitness building still applies especially for young people.

We are aware of the recommendations of at least one hour of moderate-to-vigorous intensity physical activity every day. We did not use that cut-off as we only examined leisure time physical exercise that did not include physical activities during school hours and active transportation. This is now mentioned in the paragraph describing the behavior measures (page 6).

Comment
DISCUSSION
5. 3rd paragraph: This paragraph discusses the findings of relationships between TV viewing and physical activity. It is appropriate that the authors acknowledge that TV viewing is just one of many sedentary behaviors and this could be further clarified in the 3rd last sentence: “This latter finding supports the idea that SOME sedentary behaviors and physical activity can co-exist.”

Response
We adapted this sentence as the reviewer requested.

Comment
6. 4th paragraph: “We found that among girls the high TV viewers...”. Comparisons could be made to the literature here, particularly studies that report associations between TV viewing and weight status separately by sex.

Response
We now include two references of studies assessing associations between TV viewing and overweight separately for boys and girls. Both found increased risk for being overweight with higher levels of TV viewing (Andersen et al, 1998 and Crespo et al, 2001)

Comment
7. 6th paragraph: Study limitations. As your study did not use self-report to assess children’s height and weight, the final sentence and two references in this paragraph is irrelevant.

Response
We agree and deleted this sentence

Comment
CONCLUSION
8. 2nd sentence: “Boys appeared to be more sedentary...”. The term sedentary in isolation implies inactive (ie, absence of physical activity), it would be more accurate to say that “Boys appeared to engage in more sedentary behavior, while girls participated in less sedentary behavior but were also less physically active”

Response
We adapted this sentence as the reviewer suggested

Comment
9. Typographical errors:

Response
All typographical errors have been corrected.
Response to reviewer # 2 Tuija Tammelin

Comment
The authors are encouraged to rename the clusters, because as such the titles of the clusters are somewhat misleading. For instance:
- Cluster 1 "Healthy behavior" is characterized by low TV use and low PC use. In girls, this cluster is also characterized by high level of PA (PA = physical activity) but not in boys. These clusters are different in boys and girls.
- Cluster 2 "High TV viewers" are characterized by high TV use and high PA in boys, but low PA in girls, which may lead different interpretation in boys and girls.
- Cluster 3 "Mixed" (only in boys) is mainly characterized by lack of PA.
- Cluster 5 "Unhealthy behaviour" is mainly characterized by high TV use and very high PC use. In boys Z-score for PA is slightly negative but in girls it is positive. This cluster is not behaving unhealthy when we consider PA.

Response
The reviewer is right that labels might be misleading. We tried to use brief labels to make it easier to describe the results. But it appeared that the use of these labels led to confusion. We therefore gave more information when describing the clusters in the Results section and left the labels out of the Tables. We also renamed the girls’ Cluster 5, but did not rename Cluster 3 in boys, because it was also characterized by a high score on TV viewing during dinner (besides a low score on physical exercise)

Comment
Because the characteristics of the clusters are different in boys and girls, the results (especially in Table 5) should be interpreted in the different way in boys and girls. The results between boys and girls are not directly comparable. Firstly, the use of cluster 1 as a reference groups (Table 5) leads to different situation in boys and girls. And especially, the clusters 2 and 5 are titled similarly in boys and girls but include different characteristics in boys and girls. Therefore, the comparisons between genders should be done with caution.

Response
We agree that the clusters are not directly comparable between the two genders and we recognized this in the discussion. On page 12, we explain that boys in the ‘high TV cluster’ had above average physical exercise levels.....'

And also ‘In boys, all clusters had increased risks of being overweight compared with the healthiest behavior cluster, except the high TV viewers. This latter cluster also had the lowest proportion of boys reporting low physical exercise and since physical exercise was associated with overweight status, this may explain the absence of elevated risk....'

We now merged the results from Table 5 into Table 3, and do not use the labels in the Tables anymore.

Comment
The authors conclusion "In boys, both sedentary and physical exercise appear to be important with regard to overweight, while in girls the typical sedentary behaviors (TV viewing, PC use) seem more important than physical exercise behaviors in the association with overweight" is therefore somewhat misleading.

Response
We apologize for the confusion and made some revisions according the previous comments. We still believe that the statement in the conclusion is true.

‘The main difference between these two clusters (high TV viewers (cluster 2) and High PC users (cluster 4)) and the low sedentary and low physical exercise cluster is the time spent on TV viewing and
PC use. Since the low sedentary & low physical exercise cluster did not show an increased risk of being overweight, it appears that for girls sedentary behavior is a more important factor with regard to overweight status than is physical exercise’ (page 13) still holds. And the hypothesis is further supported by the observation that the high sedentary and high physical exercise cluster showed increase odds (OR>1), although not statistically significant, for being overweight and the proportion of overweight girls in this cluster was the second highest.

Comment
The authors are encouraged to reconsider to analyse data once again, without using the variable “TV during dinner” in cluster analyses. This would maybe make the interpretation of the results easier. This variable does not essentially add information into this manuscript. TV during dinner is included in the total time of TV viewing (hours/day) and these two variables are also highly correlated (as shown in Table 2).

Response
We included the variable ‘TV viewing during dinner’ in the analyses, because it is a variable not often used but supposed to be related to overweight (because of its association with eating behavior) and can therefore give new information. That TV viewing during dinner is highly correlated with TV viewing (hours/day) is not a reason for not considering this variable in cluster analyses. Nevertheless, we reanalyzed the data without the variable ‘TV viewing during dinner’. This resulted in again five clusters for boys and five clusters for girls, presented in the table below.

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Description</th>
<th>% overweight, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ref</td>
<td>Low TV, low PC, high PE</td>
<td>11.3 (9.5-13.1%)</td>
</tr>
<tr>
<td>1</td>
<td>Low TV, high PC, low PE</td>
<td>22.3 (18.2-26.5%)</td>
</tr>
<tr>
<td>2</td>
<td>High TV, low PC, low PE</td>
<td>21.2 (17.7-24.7%)</td>
</tr>
<tr>
<td>3</td>
<td>Low TV, low PC, low PE</td>
<td>17.3 (15.4-19.2%)</td>
</tr>
<tr>
<td>4</td>
<td>High TV, high PC, average PE</td>
<td>18.4 (12.9-23.8%)</td>
</tr>
<tr>
<td>Girls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ref</td>
<td>Low TV, low PC, high PE</td>
<td>15.5 (12.0-19.0)</td>
</tr>
<tr>
<td>2</td>
<td>Low TV, high PC, low PE</td>
<td>11.4 (9.4-13.5)</td>
</tr>
<tr>
<td>3</td>
<td>High TV, low PC, low PE</td>
<td>18.4 (15.8-21.0)</td>
</tr>
<tr>
<td>4</td>
<td>Low TV, low PC, low PE</td>
<td>13.3 (11.7-14.9)</td>
</tr>
<tr>
<td>5</td>
<td>High TV, low PC, high PE</td>
<td>16.9 (0.8-23.0)</td>
</tr>
</tbody>
</table>

PE – physical exercise

This table shows that the reference cluster (with the most healthy behavior pattern) had the lowest proportion of overweight boys. All other clusters in the boys sample, showed higher rates of overweight, which was supported by findings from the logistic regression analyses adjusting for age, family educational level, country and school.

In the girls’ sample, it seems that the clusters with high TV viewing behavior had the highest rates of overweight. Clusters 3 had significantly higher odds for being overweight compared to clusters 2 and 4. Physical exercise behavior seems not to influence the proportion of overweight girls in the cluster, which is in accordance with our initial conclusions from analyses including TV viewing during dinner. Results from analyses including TV viewing during dinner showed, however, clearer results in the associations with overweight in girls. Because the inclusion of the TV dinner variable provides new information, we decided to keep the initial analyses, but included a few lines in the Discussion section discussing findings from analyses not including the TV during dinner variable.
Comment
Table 3. I would like to see 95% confidence intervals to values describing the proportion of overweight individuals in different clusters. I think this would be enough. The results in Table 5 are difficult to interpret, because the clusters in boys and girls are not characterized by similar properties. The authors could reconsider to leave the Table 5 out of this manuscript.

Response
We included 95% confidence intervals in Table 3. However, we do not agree to delete results initially presented in Table 5. Results presented in Table 5 are different from figures presented in Table 3, because the estimated ORs are adjusted for age, school and country. We believe this is valuable information. However, we now present these adjusted ORs in Table 3.

Comment
Table 4. It would be interesting to see the associations of different levels of PA and sedentary behaviours (TV and PC use) with overweight. For instance PA could be categorised into following groups: not at all, 1 to 2, 3 to 4, 5 to 6, and 7 hours or more physical exercise per week. TV viewing is quite prevalent habit among children: half of the children viewed TV for more than 2 hours per week. It would also be interesting to see the associations of TV viewing for more than 4 hours per day with overweight. And similarly for PC use for more than 2 hours per day.

Response
We agree that it would be interesting to see associations of different levels of PA and overweight, however, this was not the aim of the study. We presented associations of the individual behaviors with overweight as an illustration, but the main aim was to assess associations between different patterns of the four behaviors (described by different clusters) and overweight, and we therefore prefer not to present more illustrative associations than we did in the present manuscript.

Among boys different levels of PA were indeed associated with proportions of overweight, with the lowest proportion in the group reporting ‘7 hours or more PA per week’ (10.3%, 7.9-12.6%), significantly lower than groups reporting not at all, half an hour, 1 hour and 2-3 hours. Among girls we also found lower proportions of overweight in groups reporting 2-3 PA hours per week and 4-6 PA hours per week (significantly different from girls reporting not at all and half an hour PA per week). However, the girls reporting 7 PA hours or more per week did not have a significantly lower proportion of overweight. Which is in line with the non-significant OR for physical exercise in Table 4.

Comment
Minor Essential Revisions
Table 3. I would like to see the mean values of variables TV use, PC use and Physical exercise. It would help in the interpretation of Z-scores in Table 3.

Response
The reviewer is right. We now present mean values for the four behaviors, these figures are added to Table 1 presenting descriptive statistics for the behaviors.

Comment
Discussion
Authors write: "In accordance with the 'displacement hypothesis' we found opposite associations between physical exercise and TV viewing with overweight."
This finding does not directly support the 'displacement hypothesis'. Instead, the correlations between PA and TV use, as well as PA and computer use were inverse and significant in girls, which gives slight support to displacement hypothesis in girls, but not in boys.
Response
We deleted the sentence reading ‘in accordance…with overweight’.

Comments
Discretionary Revisions (which the author can choose to ignore)
Title and abstract I would like see the range of age among children (9-14 years) in the title and in the abstract (instead of the mean value 11 years).

Response
The age range is now included in the title

Comment
Introduction

Response
This references in now included
Response to review # 3 Mei-Yen Chen

No comments