Author's response to reviews

Title: Exploring associations between parental and peer variables, personal variables and physical activity among adolescents: a mediation analysis.

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Version: 2
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Author's response to reviews: see over
Dear Editor,

We thank you for considering the publication of our manuscript entitled “Exploring associations between parental and peer variables, personal variables and physical activity among adolescents: a mediation analysis” (MS: 9278381113609365). We thank the reviewers for their valuable comments which have enabled us to further improve our paper.

We have responded separately to each of the comments made by the reviewers and have indicated the changes that we incorporated in the manuscript. All changes are highlighted in the manuscript.

We hope that these changes have made our paper acceptable for publication in BMC Public Health.

Sincerely yours,
Maïté Verloigne

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Reviewer's report
Title: Exploring associations between parental and peer variables, personal variables and physical activity among adolescents: a mediation analysis.

Version: 1 Date: 8 August 2014
Reviewer: Tania Gaspar

Reviewer's report:
1. The topic is relevant, Article clear and well constructed, it is important and has two sources of information: adolescents and parents. It has two weaknesses related to the sample size and measurement instruments, especially related to the variables of peers and parents.

Answer:
We thank the reviewer for the valuable suggestions that helped us to further improve this paper. We acknowledge the smaller sample size. As the importance of peer influences increases in adolescence -while at the same time parents keep playing an important role-, we definitely wanted to focus on this specific age group. The children at T1 were 10- to 12-years-old and still attending primary school, so therefore, we needed to use the data from T2. Moreover, only the parents and not the children completed a questionnaire at baseline (T1). The T1 questionnaire focused solely on the family environment; personal and peer variables were not included. Thus, it is not possible to address the research questions posed in our manuscript using T1 data. We had already acknowledged the small sample size in the limitation section, but we have now added more information:

A second limitation is the small sample size, partly due to the large attrition between T1 and T2. An important reason for the large attrition rate is that the study was not initially set up as a prospective cohort study. The small sample size did not allow for stratification by sex. It is possible that parental and peer influences differ [11] and that associations may operate through different personal factors, depending on sex. Also, this may affect the generalizability of the results and the ability to detect significant associations.

Suggestions
2. Abstract
add information in the abstract related to sample mean age and gender percentage and delete the associations "close to significance".

Answer:
We have added the information on age and gender in the abstract:

Adolescents (mean age = 14.11 ± 0.59 years, 51% girls) and one of their parents completed a questionnaire and adolescents wore an ActiGraph accelerometer for a week (n=134).

We have also deleted the associations that were close to significance in the abstract.
3. Add more methodological information related to the instruments used and compare to similar studies.

Answer:
Detailed information about the questionnaire items used is provided in Table 1. However, we have added additional information in the Methods section (including similar studies that used the same instruments or questions), as suggested by the reviewer:

**Parental and peer variables.** Five parental constructs were assessed in the parent questionnaire: (a) parental co-participation in PA, (b) parental logistic support for PA (included two items; Cronbach’s alpha=0.90), (c) parental praise of PA, (d) parental control of PA (included four items; Cronbach’s alpha=0.46), and (e) parental concern about PA (Table 1). Four peer constructs were assessed in the adolescent questionnaire: (a) peer modeling of PA, (b) peer enjoyment of PA, (c) peer interest in PA, and (d) peer encouragement of PA (Table 1). Parental co-participation, parental logistic support, parental praise and all peer constructs were adapted from a reliable parent and peer support scale [30], that was already used in previous studies [30,31]. Parental control and parental concern were adapted from the Child Feeding Questionnaire [32] to be relevant in the PA domain.

**Personal variables.** Personal variables were assessed in the adolescent questionnaire (Table 1). The mean value of nine items was used to measure self-efficacy (Cronbach’s alpha=0.84). These items were adapted from the Self-Efficacy scale that was based on the Social Cognitive Theory [33] and was used in a questionnaire to measure psychosocial determinants of adolescents’ behaviour [34]. A higher mean value represents more self-efficacy to overcome barriers. Twelve items assessed adolescents’ perceived barriers to PA. These items were adapted to the adolescent population from the Pilot Survey of the fitness of Australians [35].

**Level of interest:** An article of importance in its field

**Quality of written English:** Acceptable

**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
Reviewer's report

Title: Exploring associations between parental and peer variables, personal variables and physical activity among adolescents: a mediation analysis.

Version: 1 Date: 11 August 2014

Reviewer: Jonathan Mitchell

Reviewer's report:

This is a well-conducted and well-written manuscript. Using cross-sectional data, the authors found that parents have an important role in adolescent physical activity. They specifically found that parental support could lower perceived internal barriers to being physical activity and thereby increase adolescent physical activity levels. A major strength of this study is that physical activity was objectively estimated using accelerometry and moderate-to-vigorous (MVPA) was the primary outcome. Specific comments are listed below; comment 1 is a major compulsory revision and the remaining are minor essential revisions.

Answer:

We thank the reviewer for the valuable comments which helped us to improve the paper. We have responded to the comments below and have indicated which changes have been made in the manuscript.

Major compulsory revision:

1. In the methods section, it is mentioned that there are baseline data for the participants included in this study (page 4, line 119). Given that the authors mention in the limitation section that future longitudinal research is needed, why not include an analysis that investigates change in physical activity levels from baseline to follow-up and change in perceived barriers/self-efficacy?

Answer:

We agree with the reviewer that longitudinal analyses would strengthen our findings. However, the most important reason for using the T2 data was that only parents completed a questionnaire at T1, and not the children. Further, the T1 parent questionnaire focused solely on the family environment, which means that we do not have data on the personal variables (i.e. perceived barriers and self-efficacy) and the peer variables at T1. As such, we would not be able to address our research questions from the baseline data. The HEAPS study included a
third time point (T3). However, as there was further attrition and generally poor compliance with accelerometry at T3, the sample size for analyses including both T2 and T3 in the current analyses would be quite small. This is especially true as our analyses urge the need for complete accelerometer data as well as child and parental questionnaire data. Therefore, it was decided to use the cross-sectional T2 data only, although we acknowledge the limitations of cross-sectional results. Finally, we would like to add that based on a suggestion from another reviewer of this manuscript, we have added information in the Discussion section on the use of experimental studies to confirm our findings.

Finally, this study was based on cross-sectional data and **stronger study designs are needed** to confirm the direction of associations between parental, peer, personal and PA variables among adolescents. **Longitudinal research has the ability to make causal statements, but the strongest study design is experimental research to determine if an increase in parental support causes an increase in PA levels among adolescents in the intervention group compared to the control group and if this association is mediated by a decrease in the adolescents’ perception of internal barriers.**

Minor essential revisions:

2. There is quite extensive missing data, with only 42% of the baseline sample re-contacted at follow-up. What are the reasons for this low follow-up rate? Was the follow-up assessment originally included in the baseline study design and if so were any cohort retention strategies considered?

**Answer:**

The study was initially set up as a one-off cross-sectional study, which means that the initial consent was for one point in time. At the end of the initial parental questionnaire, parents were asked if they agreed to be contacted again in the future for further research. The parents who agreed formed the sampling frame for the follow-up (T2) once funding for the follow-up was secured. If parents had consented to a longitudinal study from the beginning, participation in T2 may have been higher. A retention strategy was that participants received a summary of key findings following T1. Once it was established that the sample would be followed up, a newsletter was sent with further results.

We have acknowledged the low participation in T2 in the limitations of the Discussion section:
A second limitation is the small sample size, partly due to the large attrition between T1 and T2. An important reason for the large attrition rate was that the study was not initially set up as a prospective cohort study. The small sample size did not allow for stratification by sex. It is possible that parental and peer influences differ [11] and that associations may operate through different personal factors, depending on sex. Also, this may affect the generalizability of the results and the ability to detect significant associations.

3. Age-specific accelerometer cutpoints were used to define MVPA. Trost et al. recently compared the validity of several MVPA cutpoints and found that the Freedson et al. age-specific cutpoints and the Evenson et al. cutpoint provided the most valid estimates of MVPA (Trost et al. Med Sci Sports Exerc. 2011 Jul;43(7):1360-8). While the use of the age-specific cutpoints can be justified, I do think that it is important to note that the 15 years olds in the study have to reach a higher accelerometer count threshold than the younger participants to accumulate time spent in MVPA. This will be even more important to consider if a longitudinal approach is used.

Answer:

Although we did not use the longitudinal data, we have now added a comment in the Methods section noting the implications of using age-specific accelerometer cut-points:

The age-specific cut-points of Freedson [38] were used to estimate the time spent per day in moderate (4.0-5.9 Metabolic Equivalent of Tasks or METS) and vigorous (≥6 METS) PA [39]. Taking the age of a child into account when estimating moderate and vigorous PA is important because of the variation in oxygen consumption at rest and during submaximal exercise [40]. When using age-specific cut-points, older children in the sample have to reach a higher number of accelerometer counts to reach the threshold of 4 METS.

4. The accelerometers were worn for 8 consecutive days and at least one weekend day was required for the accelerometry data to be considered valid. How many participants provided one day and how many provided two days of weekend data? Is it reasonable to stratify the analyses by weekdays and weekend days given the limited weekend data collected? This should at least be mentioned in the limitation section of the discussion.

Answer:
We thank the reviewer for this valuable comment. The reason for stratifying the data was that MVPA levels differ on week- and weekend days among adolescents. Correlates may therefore differ as well, since adolescents spend a large proportion of their time at school (with peers) on weekdays, but have large amounts of discretionary time (often at home) on weekend days. Because our paper focused on parental and peer influences, we believe it is important to stratify the analyses by week- and weekend days. Of those included in the analyses of weekend MVPA, 25% had one valid weekend day, and 75% had two (or more if they continued to wear the ActiGraph) valid weekend days. Previous studies investigating adolescents’ PA levels on week- versus weekend days have also considered one weekend day to be valid (Corder et al., 2013; Generelo et al., 2011; Steele et al., 2010). Nevertheless, we acknowledge that it remains important to include as many (weekend) days as possible, so we have added this in the limitations section:

Another strength is the use of accelerometers to provide an objective view of adolescent’s MVPA levels. However, it could be argued whether or not data on one weekend day are sufficient to accurately estimate MVPA on weekend days. In the present study, 75% of adolescents had valid data on both weekend days.

References:


5. The statistical analyses are well described. However, I think it would be helpful to include a generic figure showing the alpha, beta and alpha/beta paths if space allows. This would also aid the reading of each section in the results.
Answer:
We agree with the reviewer that a figure would be helpful. We have added the following figure in our main document, including the $\tau$-, $\alpha$-, and $\beta$-coefficients that are explained in the statistical analyses section.

![Figure](image)

6. In the discussion, it is stated that “family-based interventions” are needed to help increase adolescent physical activity (line 252). This is certainly an approach that could be taken based on the results. However, it would be helpful if this is discussed in a deeper context. For example, who are parents that can and cannot provide logistical support? Is it possible to make modifications to increase parental logistic support? What if parents can’t provide additional logistical support due to non-modifiable reasons (e.g., both work full time jobs and have more than one child to raise)?

Answer:
We agree with the reviewer that it would be interesting to elaborate on this and we have therefore added an additional paragraph to the Discussion section:

This highlights the need for family-focused interventions to promote PA among adolescents, including strategies to increase parental support. This is especially the case for
families who have reduced capacity to provide logistic support due, for example, to factors such as financial reasons, work patterns or time constraints. Davison and Jago [45] have suggested some strategies to facilitate the provision of logistic support, such as car-pooling to and from physical activities and organising social activities for parents while their child participates in sports activities. Other strategies to increase parental support include providing parents with suggestions on possible physical activities to do together with their child and encouraging sports clubs to inform and involve parents.

7. In the results and/or discussion sections the magnitude of the associations observed should be mentioned. For example, what is the predicted difference in weekday MVPA between parents with a logistic support score of 1 and parents with a logistic support score of 6?

Answer:
We have calculated the magnitude of the significant associations by back-transforming the log-transformed values. We have now added this information in the Results section:

Main effects for associations between parental/peer variables and MVPA are presented in Table 3. For MVPA on weekdays, a significant positive association was found with parental logistic support and peer interest. For each one unit increase in parental logistic support and peer interest, mean MVPA changed by a factor of 1.08 and 1.09, respectively. A significant inverse association was found with parental control and concern. For each one unit decrease in parental control and concern, mean MVPA changed by a factor of 1.14 and 1.50, respectively. For MVPA on weekend days, a significant positive association was found with parental logistic support. For each one unit increase in parental logistic support, mean MVPA changed by a factor of 1.20. Associations with parental praise and co-participation were close to significant and in a positive direction. For each one unit increase in parental praise and co-participation, mean MVPA changed by a factor of 1.15 and 1.19, respectively.

We have also added one sentence in the Methods section to describe the back-transformations:
The mediation analyses consisted of the following steps. Firstly, main associations between each parental or peer variable and adolescents' MVPA on weekdays and weekend days were examined (τ-coefficient). In the Results, we report the magnitude of the significant associations based on back-transformation of the log-transformed τ-coefficient.
Reviewer's report

Title: Exploring associations between parental and peer variables, personal variables and physical activity among adolescents: a mediation analysis.

Version: 1

Date: 13 August 2014

Reviewer: Nicole Ezendam

Reviewer's report:
The paper ‘Exploring associations between parental and peer variables, personal variables and physical activity among adolescents: a mediation analysis.’ is well written and interesting to read. I’ve have only a few comments and questions.

Answer:
We thank the reviewer for the valuable comments that helped us to improve the paper. We have responded to the comments below and have indicated the changes that have been made in the manuscript.

Discretionary revisions
1. The authors state a clear research questions. Adding a simple flowchart with the hypothesized and analyzed associations might help the reader understanding the paper.

Answer:
We agree that a figure would be helpful to understand the aims of the paper. This was suggested by another reviewer as well. After careful consideration, we have decided to include following figure in the Methods section (Statistical analyses), since the $\tau$, $\alpha$, and $\beta$-coefficients that are explained in the statistical analyses are also presented in the figure.
2. In the discussion the authors suggest to perform longitudinal research to confirm the findings. However, as PA is often a long term habit and psychosocial determinants are often rather stable longitudinal studies might not clarify the issue of the direction of the associations (causality). In my believe we do need in-depth analyses of trial results to assess causality.

Answer:
The reviewer raises an important research issue and we acknowledge the limitations of longitudinal research and the strengths of experimental research. Therefore, we added this suggestion in the Discussion section:

*Interventions should therefore focus on helping parents to support their child’s PA throughout youth to foster positive cognitions towards PA. Although our cross-sectional findings are in line with the theoretical EnRG-framework [7], longitudinal research and especially experimental research are needed to confirm this hypothesis and to make causal inferences, particularly given that reverse causality between MVPA and internal barriers is plausible, whereby higher MVPA levels may lead to fewer perceived internal barriers. (...) Finally, this study was based on cross-sectional data and stronger study designs are needed to confirm the direction of associations between the parental, peer, personal and PA*
variables among adolescents. Longitudinal research has the ability to make causal statements, but the strongest study design is experimental research to determine if an increase in parental support causes an increase in PA levels among adolescents in the intervention group compared to the control group and if this association is mediated by a decrease in the adolescents’ perception of internal barriers.

Minor essential revisions

3. Did the authors compare the respondents with the non-respondents? Adding this information to the paper might provide some information on selection of the sample. Can it for instance be that children with a lower self-efficacy for PA dropped out leading to a sample with less variation in self-efficacy causing the non-significant effect for this moderator?

Answer:
We are not able to examine if self-efficacy or the other mediators tested in our analyses varied between respondents and non-respondents at T2, because the baseline survey did not include these measures. However, in response to this comment, we have examined baseline socio-demographic and PA differences between those followed up and those who were not followed up. These analyses showed that a higher proportion of those whose parents returned the T2 questionnaire had high maternal education and participated in 9.5 mins/day more MVPA on weekends compared to the remainder of the baseline sample. There were no significant differences according to sex, maternal employment or country of birth, or MVPA on weekdays. The following sentence has therefore been added to the manuscript:

In total, complete adolescent and parental questionnaire and accelerometer data were collected from 134 adolescents (67%) at T2. Those who were followed up had a higher level of maternal education (45% vs. 33% high education, p<0.05) and weekend MVPA (65.1 vs. 55.6 mins/day, p<0.05) than the remainder of the baseline sample.

4. Please add to the statistical analysis section that you performed linear regression analyses.

Answer:
We have added this information in the statistical analysis section:

Linear regression analyses were conducted using SPSS version 22.0 (SPSS Inc., Chicago, IL, USA).
5. Table 1, the four items of parental control have a low Cronbach’s alpha. Did the authors explore if the scale could be optimized?

Answer:
We agree with the reviewer that this is not a high Cronbach’s alpha value. We have explored if deleting one of the items would lead to an improvement in internal consistency: results showed that deleting the first item (‘If I did not guide or regulate my child’s activities, (s)he would not be as active as (s)he should be’) would lead to a slightly higher Cronbach’s alpha (0.50), but this is not a very significant improvement. Also, we decided to keep the four original items and not to use the single items, because we wanted to provide information on the general concept of parental control. The four items relate to different aspects of parental control and a higher score on the scale represent a higher use of parental control strategies in general.

However, we have still added this low Cronbach’s alpha-value to the limitations of the study:
A first limitation is the use of single items to assess some of the parental and peer variables. Some items were combined to form particular constructs with high Cronbach’s alpha values being reported for all constructs except for parental control.

6. Table 3, please add the unit of MVPA to the title, e.g. hours/day

Answer:
We have added this information in the title of Table 3:
Table 3: Main associations between parental and peer variables and MVPA on weekdays and weekend days (mins/day)

Level of interest: An article of importance in its field
Quality of written English: Acceptable
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