Author's response to reviews

Title: Objectively assessed recess physical activity in girls and boys from high and low socioeconomic backgrounds

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Version: 2 Date: 15 January 2014

Author's response to reviews: see over
Reviewers report

Title: Objectively assessed recess physical activity in girls and boys from high and low socioeconomic backgrounds

We thank the referees for their constructive comments and feel that the consideration of these points has helped us to substantially improve the paper.

Please note that the changes to the manuscript have been indicated in red font in this submission. We have given a point-by-point response to the comments below.

Reviewer’s report:

Major Compulsory Revisions (which the author must respond to before a decision on publication can be reached)

1. There are some crucial methods missing from the data reduction section of the accelerometry analyses that need to be included.

We agree with this comment. The responses to the reviewer’s comment have been reported in responses 2, 3 and 4 below.

2. I.e: The MET values used are not exact to the ones in the reference provided. Some reasoning behind why these MET values are chosen is needed.

The use of 3 or 4 METs to determine the moderate intensity threshold has been subject to recent debate in the literature. A study by Trost and colleagues (2011, MSSE) used 4 METs to define moderate intensity physical activity in children and adolescents. Indeed, there is evidence that shows that brisk walking, which is often used as the behavioural indicator for moderate intensity physical activity, is associated with an energy cost that is approximately 4 METs (Trost et al., 2011, MSSE). As such, we have taken the decision to continue the use of 4 METs to define MPA. As the age-dependent threshold was not developed to determine sedentary time, we used a cut-point of 100cpm, which Trost et al. (2011) reported exhibited excellent classification accuracy.

To clarify the paper, we have modified the following sentence as:

“Age-specific count cut-points corresponding to Light (LPA; ≤3.99 METs); Moderate (MPA; 4.00 METs - 5.99 METs); Vigorous (VPA; ≥6.00 METs); and Very high (VHPA; ≥9.00 METs) were derived from the METs prediction equation, i.e., METs = 2.757 + (0.0015 x counts.min⁻¹) – (0.08957 x age [year]) – (0.000038 x counts.min⁻¹ x age [year]) r=0.74 [14]. MPA, VPA and VHPA were summed to obtain time spent in moderate- to vigorous-intensity physical activity (MVPA). A threshold of 4 METs was chosen to represent MPA as brisk walking has been associated with an energy cost of 4 METs in calibration studies [13]. A cut-point of 100 counts.min⁻¹ was used for sedentary activity as it exhibited excellent classification accuracy [14] and is a good estimate of free-living sitting time [15].”

Instead of
“Times spent below and above the different intensity thresholds - sedentary (SED, <1.79 METs), light (LPA, 1.79≤LPA<4 METs), moderate (MPA, 4≤MPA<6 METs), vigorous (VPA, ≥6 METs), very high (VHPA, ≥9 METs) - and from moderate to very high (MVPA, ≥4 METs) were calculated. ActiGraph outputs analyzed following the procedures of Trost et al. [13].”

3. Addition of the cut-points used would also be of benefit to the reader, especially as 2s epochs were chosen which have not been used in any of the cut-points evaluated in the Trost reference.

Thank you for this comment. We acknowledge that Trost and colleagues (2011) used 1-s data epochs, which were reintegrated into 60- or 30-second epochs, dependent on the equation. For the purpose of this study we adjusted the age-dependent cut-points based on the 2-s epoch, which is common practice within the literature. As the cut-points that we used are age-dependent, and the age range in the study was 6-11 years, we have not provided the cut-points for each age. We have, however, provided the equation to assist the reader in determining what was used (see comment 2).

4. Definition of non-wear needs to be included.

For the purpose of this study a non-wear definition was not used. As the research staff monitored whether the children were available for data collection on each day, it was assumed that the participants wore the monitor during each day they attended. To be included in the analyses, children needed to have worn the monitors during each recess (morning and afternoon) on the 4 days of data collection. If a child was not present during at least one of the recesses or if the data were corrupted (which was assessed on download), they were not retained for the statistical analyses conducted. Forty-six children (22 girls and 24 boys) did not have complete data and were removed from the analyses.

In the data reduction section, the sentence was rewritten as:

“To be included in the analyses, children needed to have worn the monitors during each recess (morning and afternoon) on the 4 days of data collection.”

Instead of

“Files with missing data were deleted.”

5. Definition of the min number of days of recess to be included in the analyses. It says children that didn’t have a full data set (4 days) were excluded, but is this 4 full days of morning and afternoon recess? How many minutes in a recess period did they have to wear it?

The minimum number of recess was defined in the “physical activity monitoring” paragraph. If the child was not present during one of the recesses, they were not retained for the statistical analyses. Each recess period lasted 15 min (30 minute total) and the children had to wear the accelerometer during this time. A recess wear-time criteria was not used in this study (unlike others recently published e.g. Ridgers et al. 2012, BJSM) as the research staff were able to monitor whether the children were available for data collection on each day (see point 4 above) and therefore complied with the protocol.
6. The discussion should be revised. There are statements of what previous research has found, but they aren’t written in such a way to refute or support the results.

We have revisited the discussion and have revised it in the new manuscript. Due to the number of changes made, we have highlighted the changes to the manuscript in red font in this submission.

7. More discussion on the limitations of how SES was determined needs to be included or some discussion on how the equipment at the schools differed.

Thank you for your suggestion. We have now added a paragraph to the discussion section as follows:

“Ridgers et al. [7] reported that access to different facilities (spaces, gyms) or providing equipment is benefit to children’s PA during recess. In the present study, all participating schools had similar playground space and the equipment did not differ between schools. This suggests that other factors of school environment could explain PA level differences, such as social exclusion or playground issues, for example. However, as no data concerning children’s actual play behavior during recess time was collected in the present study, no clear conclusions can be drawn. In addition, the contribution of recess to the children’s weekly PA could not be evaluated as children did not wear the devices outside school. It would be interesting to compare the impact of SES at school and outside school and to quantify the contribution of recess to daily physical activity. Moreover, lunchtime PA was not included in the study as children in the participating schools could eat lunch at school or go home and return throughout lunchtime. This made it difficult to determine how PA was undertaken at school.”

8. Some indication of what the % difference in time spent within each activity category is needed…. I.e: is a 4.5% difference clinically significant?? How many minutes does this constitute?

The % difference in time spent within each activity category is reported in the results section. High-SES children are about 2 min 24 s (4%) more active per day during recess, which was a significant difference. This difference was higher in boys (4 min) than in girls (1 min). While this difference is arguably small, research has shown that recess can contribute up to 40% towards a child’s daily physical activity recommendations (Ridgers et al., 2006, Sports Medicine) and up to ~30% of their daily physical activity (Ridgers et al., 2011, JoSH). Whilst we did not collect PA data across the day in the study, which we acknowledge as a limitation (see Point 7), this study highlights that children in low and high SES schools are active during school recess. It is clear though that playground interventions may have a positive effect on PA levels during this time for children from different SES backgrounds.

Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

Edits:
1. Page 10, line 187-188. Revise sentence. unclear
We agreed with the reviewer that the sentence could have been clearer. The sentence was rewritten as:

“These studies suggest that it is important that low SES children have easy access to high-quality PA facilities and support at school. Debourdeaudhuij et al. [12] have reported that a PA stimulating environment was an important factor for low SES children PA compared to their counterparts in high SES areas. However, interventions to promote PA had similar effects in adolescents regardless of SES background and were not able to show a significant widening or narrowing of inequalities [12].”

Instead of

“A PA stimulating environment is an important factor for low SES children PA to the contrary of their counterparts of high SES area [11]. Consequently, it is important that low SES children have easy access to high-quality PA facilities and support at school. Debourdeaudhuij et al. [11] have reported that interventions to promote PA had similar effects in whatever SES adolescents and were not able to show a significant widening or narrowing of inequalities.”

2. Line 196. Should read “…. Data provided from morning and afternoon recess, excluding lunch recess, were similar to those previously reported…."

The sentence was modified following reviewer’s comment.

3. Page 11, line 204. Revise. Unclear

We fully agreed with the reviewer. The sentence “Socioeconomic background was not a determinant of girls’ MVPA compared to boys.” was deleted.

4. Page 12, line 228 …. Should read “Authors also didn’t report”

The sentence was modified following reviewer’s comment.

Please note that a native English speaker has read the paper.
Reviewer's report

Title: Objectively assessed recess physical activity in girls and boys from high and low socioeconomic backgrounds

Version: 1 Date: 1 December 2013
Reviewer: Erica Hinckson

Reviewer's report:
The authors objectively measured school recess physical activity in children from high and low socioeconomic backgrounds.

Major Revisions
Introduction

While the authors summarized the literature around SES and children’s physical activity well, I am curious to know the reasons behind this study and the comparisons between high and low SES during recess.

Is it simply that we don’t have enough data examining the differences between high and low SES during recess.

Thank you for this comment. A review published by Ridgers et al (AJPM, 2012) that examined the correlates of children’s physical activity during school recess noted that only three studies (4 samples) had examined associations between physical activity and SES, and the association was inconclusive. As the literature on this topic is very sparse, notably without PA objective measurements, this study aimed to contribute to this current literature gap. This has been clarified in the introduction.

Why would SES play a role while at school? Usually schools sit in low or high SES neighborhoods and the availability of equipment or opportunity for physical activity may differ from school to school.

This is an interesting comment. House (J Health Soc Behav, 2001) has examined the effects of socioeconomic inequalities on children’s PA participation. Higher social classes convey positive attitudes towards PA and healthy lifestyles, which are thought to influence children’s attitudes and health-related behavior. In addition, Seabra et al. (JSMS, 2013) have reported that children’s attraction to PA varies in accordance with sex and SES and demonstrated a socioeconomic trend with regard to the perceived importance of participating in PA. In the school context, recess provides an opportunity for children to be active and accounts for approximately a quarter of the primary school day. As recess presents an ideal opportunity to engage children’s physical activity behaviors and contributes to daily physical activity recommendations, children’s peers or parent’s positive or negative attitudes towards PA and the perceived importance of participating in PA might influence this engagement at school. We agree that equipment provision from school to school based on SES background can also play a role, however in the present study all participating schools had similar playground space and the equipment did not differ between schools.

I am struggling with the rationale. Perhaps the introduction needs another paragraph or two justifying this comparison at recess during school. I also can’t see how this information will inform interventions.
There is a need to know whether children in low and high SES areas engage in similar amounts of PA during school recess. Outside of school children from low SES areas have been found to be less active (Seabra et al., JSMS, 2013), therefore recess may provide an opportunity to increase their PA levels as a safe environment conducive for PA can be provided (markings, equipment etc). Prior to intervening, however, it is important to know how active they are during this time compared to their high SES peers.

Methods

**Line 123: why was SED established at 1.79 METs that is higher to the recent definition of sedentary behaviour at less than 1.5 METs?**

Thank you for this comment and for spotting this error. In this study we used the age-dependent cut-points to determine physical activity intensity. As the age-dependent threshold was not developed to determine sedentary time, we used a cut-point of 100cpm, which Trost et al. (2011) reported exhibited excellent classification accuracy. This is consistent with the published literature and in line with the recent definition of sedentary behavior.

To clarify this issue in the paper, we have modified the following sentence as:

"Age-specific count cut-points corresponding to Light (LPA; ≤3.99 METs); Moderate (MPA; 4.00 METs - 5.99 METs); Vigorous (VPA; ≥6.00 METs); and Very high (VHPA; ≥9.00 METs) were derived from the METs prediction equation, i.e., METs = 2.757 + (0.0015 x counts.min\(^{-1}\)) – (0.08957 x age [year]) – (0.000038 x counts.min\(^{-1}\) x age [year]) (r=0.74) [14]. MPA, VPA and VHPA were summed to obtain time spent in moderate- to vigorous-intensity physical activity (MVPA). A threshold of 4 METs was chosen to represent MPA as brisk walking has been associated with an energy cost of 4 METs in calibration studies [13]. A cut-point of 100 counts.min\(^{-1}\) was used for sedentary activity as it exhibited excellent classification accuracy [14] and is a good estimate of free-living sitting time [15]."

Instead of

"Times spent below and above the different intensity thresholds - sedentary (SED, <1,79 METs), light (LPA, 1.79≤LPA<4 METs), moderate (MPA, 4≤MPA<6 METs), vigorous (VPA, ≥6 METs), very high (VHPA, ≥9 METs) - and from moderate to very high (MVPA, ≥4 METs) were calculated. ActiGraph outputs analyzed following the procedures of Trost et al. [13]."

**Also more detail is needed in terms of data reduction and cleaning? What criterion was used for a valid day? What was a valid day? Were a number of consecutive zeros deleted? Were the children asked to complete a log with missing times?**

Thank you for your comments, some of which were also raised by the first reviewer and have been addressed (see Reviewer 1 point 4). Please note that a valid day was considered to consist of wearing the monitors during the 2 recess periods of the day, and forty-six children (22 girls and 24 boys) were removed from the analyses as they did not have 2 recess a day for the 4 days of measurement. No log was completed with missing times. This information has been added to the manuscript.

In the data reduction section, the sentence was rewritten as:

"To be included in the analyses, children needed to have worn the monitors during each
“recess (morning and afternoon) on the 4 days of data collection.”

Instead of

“Files with missing data were deleted.”

**Discussion**

I was hoping the discussion would address my above concern somehow. There was not an assessment of the school environment and that is also a limitation. What would be the reasons of the differences observed during recess? The fact that the accelerometers were not worn during the whole day further limits this study. While the sample size is large, the concept and design of the study is limited and therefore I would recommend that this is presented as a short report.

The discussion has been revised in the new manuscript following reviewer’s comments. The changes to the manuscript have been indicated in red font in this submission. We agree that the lack of whole data is a limitation in this study, and has been acknowledged in the discussion.