Author's response to reviews

Title: The relationship between school physical activity policy and objectively measured physical activity of elementary school students: A multilevel model analysis

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Author's response to reviews: see over
Dear editor,
Thank you for your patience regarding this manuscript. Based on reviewer feedback we have reanalyzed the data and modified the manuscript to reflect the new findings. While written physical activity policy remains significant, we now also show that children are more active at schools that support active transportation when we control for wear time. An additional paragraph discussing this has now been added. A point by point response to the reviewer comments now follows.
Thank you for your editorial support, and the insight of the two reviewers which have significantly strengthened the paper.

Yours sincerely
Guy Faulkner

Reviewer’s report
Title: The relationship between school physical activity policy and objectively measured physical activity of elementary school students: A multilevel model analysis
Version: 1 Date: 31 October 2013 Reviewer: Willem De Keyzer

The authors report on the relationship between school level characteristics assessed using the School Health Environment Survey (SHES physical activity tool) and objectively measured physical activity of students using accelerometry. Therefore, a sample of 17 elementary schools comprising 856 students (PR: 50%) was studied.
The manuscript is in general very well written and data is presented in a sound scientific way.

• Major Compulsory Revisions Discussion:
  1. The authors mention the cross-sectional design of their study which prohibits them to investigate causal relationships between school environment and PA. This statement is valid, however, some practical implications of their finding that schools with written policies on PA were observed to have students who were more physically active should be provided. Obviously, increase of written policies alone will not increase the PA of students on any given school. Please elaborate also on the possible underlying mechanisms and potential for future research.

Our new analyses also found that schools promoting active school transport had more physically active students. Implications of this are provided on page 12. We also suggest that policies may play such a role at least indirectly in supporting physical activity of children. On page 14, we write:

Developing written policies regarding physical activity demonstrates a commitment to encouraging this health behaviour, while outlining expectations of the roles and
responsibilities of staff, students and parents. Such policies might also reflect on strategies that could address consistent disparities in physical activity patterns of children, particularly between boys and girls.

- Minor Essential Revisions Background:
  2. Consider revising the Background section by adding some information about the work performed by Leatherdale et al., i.e., how was physical activity assessed in that study? Also, in my opinion, the paragraph on the results from the study performed in Denmark and US would fit better in the discussion section.

Our introduction was bridging two bodies of literature – the work of Leatherdale has assessed physical activity through self-report which is prone to bias. They have however looked at the association between self-reported physical activity and the school environment. The cited studies performed in Denmark and USA have used objective measures of physical activity but not assessed environmental/policy influences on physical activity. Our study addresses both objective measures of physical activity and environmental/policy influences. We highlight that Leatherdale assessed physical activity through self-report on page 4.

Methods:
3. Please provide school level descriptives like measures of central tendency and dispersion of total number of students per school. This provides the reader with an indication of the size of the schools investigated.

On page 5 we add Schools ranged in size from as few as 37 grade 5 and 6 students, to 160 grade 5 and 6 students, with the average size being 103 students.

On page 6, we add Using grade-specific enrolment information provided by the TDSB at the start of the 2009/2010 school year, the percentages of total grade 5 and 6 students who participated in this study were calculated. Participation ranged from as low as 34.4% of eligible students at one school, to as high as 95.2% at one school. The average participation rate, per school, was 61.3%.

4. Please elaborate on the sentence: “Given the conservative cutoff points adopted ....” This is unclear to me.

We cite reference (10) that expands on this point. In many studies with children and youth, moderate intensity is defined as 3 METs or more. However, more recent evidence suggests that a threshold of 4 METs or more may be more
appropriate for describing moderate or higher intensity activity in children and for determining relationships between activity and health outcomes. We used 4 METs as a threshold for MVPA and this reduced variability in this outcome.

Results: 5. I feel that figure 1 adds little to the manuscript. The paragraph explaining the figure is redundant (this point was already addressed in the preceding paragraph)

We feel that the figure provides a nice graphic of the key finding. However, we are happy to remove on editorial request.

• Discretionary Revisions 6. Results: “Overweight/obese students had on average 5.27 fewer minutes...”

This has now changed to 5.10 minutes with the revised analysis.

Level of interest: An article whose findings are important to those with closely related research interests
Quality of written English: Acceptable Statistical review: Yes, but I do not feel adequately qualified to assess the statistics.
Declaration of competing interests: I declare that I have no competing interests
Reviewer's report
Title: The relationship between school physical activity policy and objectively measured physical activity of elementary school students: A multilevel model analysis
Version: 1 Date: 18 November 2013 Reviewer: Natalie Colabianchi

Reviewer's report:
This paper examines the effect of various school-level policies on objectively measured physical activity across 17 schools in Canada. Overall, it is a well-written paper; however, several clarifications and further justification are needed to strengthen the paper.

Major Compulsory Revisions:
The authors examine light to vigorous activity as their outcome. Their rationale for including light activity in addition to moderate to vigorous activity is that the cut points they used to define MVPA were conservative (yet by including light activity participants are getting 3.5 hours a day of activity). Their rationale is not entirely satisfying as they could instead choose different cut points for their MVPA definition. If they want to include light activity for theoretical reasons, they should bolster their justification with additional references (including additional studies that examined the benefits of light activity in kids) or perhaps just model proportion of sedentary.

We have added further justification on page 7

Increasing emphasis is being placed upon exploring all accelerometer-measured intensities of physical activity in analyses, especially light activity [12] which has largely been ignored in the accelerometer literature, given health benefits accrue when sedentary time is replaced by light activity (Hamilton et al., 2008). Time spent in light intensity physical activity has favourable associations with some biomarkers (blood pressure, cholesterol) in adolescents (Carson et al., 2013).

More pertinent to the current study, is the rationale that we provide on page 7

More importantly, it is likely some environmental influences are more prone to impact light physical activity. For example, a supportive social environment may encourage incidental physical activity throughout a school day rather than facilitating structured bouts of moderate to vigorous physical activity.

The authors need to clarify why they control for sedentary time, especially in light of the fact that they include light activity in the moderate to vigorous outcome. Total accelerometer counts are made up of sedentary, light, moderate and
vigorous activity. Because the latter three categories constitute their outcome, the balance of the counts/minute– here, defined as sedentary time –is a direct function of wear time (i.e., wear time - defined outcome = sedentary time). If it is theoretically important to control for sedentary time, then proportion of sedentary time might be a better measure (if, in fact, the authors are not intending to control for wear time).

We have controlled for wear time in our analyses. In doing so, there is a new finding – children were more physically active in schools that promoted active school transportation.

For how long was data collected in each school and across the study? Could the ICC be influenced by seasonality (i.e., the between school variance is partially due to collecting activity data over different seasons?)

We do not believe seasonality was a major influence. The initial focus of BEAT was on school travel – therefore, data collection took place during spring and fall during conditions which would be conducive to active school travel. Our existing research in Toronto has actually shown no seasonal differences in rates of active school travel across the school year. Essentially, we tried to minimize any seasonal effects. On page 5 we clarify,

To minimize seasonal effects, data collection did not take place during the winter months (mid-December to the end of March).

The response rate for school inclusion was quite low (11.5%). The authors should comment on how the low response rate may affect the results and whether there are any administrative data that could be used to compare schools that participated versus schools that did not. Similarly, the response rate for students was low (50%). Again, could the authors comment on how the low response rate may affect the results and whether there are any administrative data that could be used to compare students that participated versus students that did not? It would also be informative to know the extent to which various variables resulted in the loss of participants. For example, if the weekend day requirement for accelerometer wear was dropped, would that increase the response rate? Did some kids have complete data but not a parental survey?

Project BEAT was a focused examination of how the built environment influences school travel. We purposefully sampled 16 (which became 18 for oversampling purposes) schools that varied carefully on built environment characteristics and socioeconomic status. Due to school board ethics, schools are invited to participate in studies so we selected from those that volunteered. Accordingly, the school inclusion rate of 11.5% was not a meaningful indicator for us. More importantly was response rate in schools. Our 50% response rate was consistent with several previous active consent studies examining obesity and physical activity among Canadian elementary students [7,9]. Due to ethics,
we do not have administrative data to compare participants versus nonparticipants.

We now clarify our student response rate as similar to existing studies on page 5/6 and we add a further limitation on page 16

As data were drawn from a convenience sample of schools, we cannot infer that these results are representative of all schools in Toronto.

Regarding missing data, the accelerometry literature has documented clear differences in physical activity levels between weekday and weekend days (Page et al., 2005; Rowlands et al., 2008; Stone et al., 2009b), and the inclusion of at least one weekend day as a criterion for participant inclusion is common.

References:


Although the authors did find one significant association, there were 21 other school variables that were not significant. Thus, the conclusion should also emphasize the lack of associations in the 21 other school variables and note that the one significant finding may have occurred only by chance (given the number of analyses run). Along these lines, the abstract should state how many environmental characteristics were examined so readers who only read the abstract have a sense of what proportion of environmental characteristics were significant.

As suggested we have added the number of characteristics to the abstract. In the limitations section page 16 we have added

Twenty-two school-level variables were assessed but only two were significant. Given the number of analyses, the significant findings may have occurred by chance. Future research with larger samples is needed to confirm our findings.

The discussion introduces new variables which were not previous described
If additional results are going to be discussed, they should be described in the methods and results rather than having a first introduction in the discussion.

These are not new results but a discussion of the items used to assess school policy, and school transportation within the SHES. Some mention of what may explain differences by indicator appears warranted to us.

Is there a significant difference in physical activity levels between maintenance schools and action schools? If so, could the authors speculate why students in maintenance schools would have lower activity levels than students in action schools?

This was not assessed but we compared to the schools in the initiation phase. We now add on page 13.

It is also not clear why children were more active at schools in the action phase for both indicators as opposed to the maintenance phase. Other unmeasured variables may be contributing to this difference. For example, schools in the action stage for supporting active school travel may be located in locations that are more conducive to active school travel. Alternatively, the primacy of current school initiatives compared to past priorities (i.e. those in the action phase compared to those that are already in the better-established maintenance phase) may contribute to this phenomenon in that staff may be more likely to attend to issues that are more immediate.

Minor Essential Revisions
In the first paragraph of the study design, the authors write “three phases” but only list two ranges of data collection, so it is not clear what the three phases were.
We have just deleted ‘three phases’

Table 2: Are statistics calculated for schools or for students? I had assumed schools but most (all) of the percentages are not the result of a number divided into 17 so it is not clear.

The %’s reflect schools in the initiation, action or maintenance stage – it is now clarified that there were 18 schools for the purposes of this analysis.
The second last paragraph before the discussion is confusing as written.

We have reviewed and slightly modified this paragraph.

Discretionary Revisions
The authors speculate in the discussion that different samples could be the reason why their results are different when comparing a study using self report physical activity versus objectively measured activity. Please clarify whether the 17 schools in this study are a subset of the 30 schools in the previous study. If so, more details are needed on how these schools were selected and how they might be different. In theory, the speculation (different results because different samples) could be tested if these 17 schools are a subset of the original 30 by examining the effects using self report in the same sample of schools with only objective data.

No, these are different studies and different samples.

As a supplemental analysis, the authors also examined the effects of the school-level predictors on physical activity just during the school day. They need to state why their main analysis is presented in the context of physical activity throughout the day versus just during school. Why is the former preferable? If the latter is preferable, the results and tables should reflect that analysis. Provide some basic descriptive on who filled out the school survey (e.g., % principals, % counselors, etc.).

Our preference is throughout the day. The SHES captures influences on physical activity that could have an impact before and after school, and on weekends (e.g., Community partnerships). Indeed, our findings that children were more active at schools that provided support for active school travel supports this important distinction. This indicator was not important when just looking at the school 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