Reviewer’s report

Title: Developmental Trajectories of Physical Activity in Adolescence among Girls: National Growth and Health Cohort Study

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Reviewer: Hannah Brooke

Reviewer’s report:

This longitudinal study was a secondary analysis of self-reported physical activity data collected between 1987 and 1997 from adolescent girls in the US. The study attempts to use a novel methodology to address the important and complex issue of how physical activity changes during adolescence. The study clearly demonstrates how group-based trajectory analysis could be used to address research questions in this field. However, due to limitations of the data used for analysis the ability of the study to contribute answers to this field is questionable. Had this study been conducted using up-to-date and objectively measured physical activity data it would have been extremely interesting and important for the field.

• Major Compulsory Revisions

In its current form the relevance and contribution of the study for addressing the research question is questionable due to the limitations of the data used for analysis (highlighted below). Ideally this study would be conducted using up-to-date and objectively measured physical activity data. Despite this, the study clearly describes and demonstrates the application of a novel methodological approach to the research question, which could be an important tool for the field.

Limitations of data used for analysis

Due to the substantial changes in social, cultural, technological and environmental landscapes over the last 20-30 years, data collected on adolescents between 1987 and 1997 has limited relevance for understanding changes in physical activity and sedentary behaviour in adolescence today.

The rational behind the sampling strategy is somewhat unconvincing and the extent to which the sample may be representative of any broader population is unclear.

The authors state “The HAQ is a validated instrument against 3-day activity diary and accelerometry data to assess…PA in the past year”. It does not seem possible that 3 days of activity diary and accelerometry data can be appropriate validation criterion for PA in the past year. Moreover, in the paper referenced by the authors [27] the correlation between the accelerometer data and HAQ is very low (rs = 0.09) which suggests that the HAQ does not reflect the actual physical activity that has been performed. Although questionnaire data may be adequate
to address some research questions, for the current study, which attempts to
assess detailed patterns of physical activity over time, it seems fundamental to
use a more valid and precise measure of physical activity. The HAQ score in
“MET-times per week” is particularly problematic. Aside from the assignment of
METs to children’s self-reported activities – which is likely to vary considerable
between children and activity context - to multiply the assigned METs by a
“frequency” score and then a three level “fraction of the year” score seems
unlikely to result in much more than measurement error. Moreover, duration of
activity participation was not taken into account, so it is unknown whether those
children with a higher number of different activities (and thus high HAQ score)
were actually doing more activity than a child with a low number of different
activities (and thus low HAQ score) or if they spent less time on each individual
activity. It seems that a high HAQ score could be achieved by doing many
different activities of low MET value, infrequently, or by doing a smaller number
doing different activities of high MET value, frequently. These possibilities may
represent distinct groups with very different implications for policy, practice and
health outcomes, however, it is not possible to separate them using the HAQ
score. The HAQ seems highly dependant on how each child interpreted the
question for example one child may report “dancing” 4 times per week where
another may report, “ballet”, “tap” “modern” and “jazz” as separate activities
resulting in very different HAQ scores. The authors acknowledge that: “future
research should confirm the existence of maintenance trajectories in a large
cohort study using objective PA measures”. However, I suggest that a different
data set with objective measures of physical activity should have be used for this
analysis. Due to the limitations of the self-reported data, any number of
speculations could be made to explain the activity trajectories reported in the
manuscript. For example the ‘substantially decreasing high PA’ group may simply
be a group of children with the propensity to over report their activity level in early
questionnaires and those children that ‘maintained’ their activity level could be
children more susceptible to social desirability bias at older ages and thus over
reported their activity in the later questionnaires.

As acknowledged by the authors, the methods used to collect data on TV
watching changed over time, which may have led to differential bias.

• Minor Essential Revisions
Background, para 2: Remove “such” in sentence “An advanced analytic
approach that could complement such traditional analytic approaches…”
Background, para 4: Rephrase to “…in larger, more diverse, study populations…”
Background, para 4: If stating “national debate”, please mention which nation you
are referring to. I believe the debate about sedentary behaviour
recommendations is international, so this may be more accurate.
Background, para 4: In the last sentence, please rephrase to clarify what is
meant by “and their risk factor”.
Methods, para 1: Please include further details regarding the selection procedure
e.g. How were the schools selected for invitation to the study? How many
schools were invited? How many school participated? Within each school who was invited to participate? What is the reported participation rate based on? Further clarification of the external validity is necessary.

Methods, para 1: Please clarify what is meant by “census track data showed similar percentages of Black and White children with the least degree of income disparity between races”. What is it “the least” out of? What were the other choices of areas?

Methods, para 2: Please state the time-frame for the HAQ.

Methods, para 2: Please provide a definition for METs.

Methods, para 2: Please state the potential range for the weekly frequency score. Was it possible for a child to participate in an activity more than once per day e.g. they may run around at multiple break times at school, then run around when they get home before dinner, and then run around again after dinner, resulting in a reported frequency of “running” 20 times per week?

Methods, para 2: Please report the range of MET values possible for reported activities – in the discussion you state that you also included lower intensity PA – please give some examples of the lower intensity activities in the methods.

Methods, statistical analysis: Please clarify whether HAQ scores were treated as a continuous or categorical variable for determining the group-based trajectories – currently categories are first mentioned in the results section for labelling the trajectory groups.

Methods, model diagnostics: Please clarify what is mean by “reasonably narrow” confidence intervals.

Results, para 4: The authors give an illustration of how the HAQ score can be interpreted using the example of brisk walking. They state that this is assuming 30 minutes per bout. Activity duration is not included in the calculation of HAQ score, therefore there should be no assumption about the bout duration included in this illustration. In addition, the authors must have assumed a “fraction of the year” score to calculate the HAQ score, this is not mentioned in the illustration, but should be included. It would be useful to also include what MET value was assumed so the reader can work through the calculation himself or herself.

Results, para 5, last sentence: It is stated that those with the unhealthiest PA pattern followed declining patterns of TV viewing (TV groups 3 and 4). However, TV groups 3 and 4 were stated to be increasing – please correct this error. Also, please clarify what is meant by unhealthiest PA pattern – maybe use the group label “declining from moderate” instead?

Discussion, para 1: Please mention the declining trajectories as well as the maintenance trajectories.

Discussion, para 2: Please rephrase “landed at a similar level of PA” to something less colloquial.

Discussion: Please extend the discussion to include the impact that using self-reported data might have had on the results.

Table 2: P-value rather than P.
Table 3: Please be consistent with capitalisation of column headers.

- Discretionary Revisions

Background para 1: It may be useful to add some additional context about why physical activity is important to understand and why insight about changes in PA behaviours over time would be beneficial.

Background, para 4: The second half of this paragraph doesn’t seem to fit well here – consider including this earlier.

Methods: Did you consider including potentially confounding variables in your analysis?

Results, para 4: For clarity I suggest calling the ‘substantially decreasing high PA’ group ‘substantially decreasing from high PA’ and the ‘decreasing moderate PA’ group ‘decreasing from moderate PA’, as these groups are in the low PA band by the end of the study. Similar changes would be beneficial for TV viewing labels. Update this in Table 4.

Results: It would be interesting to re-run analyses without including METs in calculation of the HAQ score to give an analysis of patterns of activity frequency over time. This would remove one source of measurement error from the exposure.

Results: It would be interesting to re-run analyses separately for classes/lessons and unstructured PA to assess whether patterns are similar for these potentially distinct categories and contexts of activity.

Table 1: consider including p-values for the comparison characteristics.

Level of interest: An article of importance in its field

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