

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (<http://bmjopen.bmj.com/site/about/resources/checklist.pdf>) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	The association between objectively measured physical activity and longitudinal changes in body composition in adolescents; The Tromsø Study Fit Futures Cohort.
AUTHORS	Aars, Nils; Beldo, Sigurd; Jacobsen, Bjarne; Horsch, Alexander; Morseth, Bente; Emaus, Nina; Furberg, Anne-Sofie; Grimsgaard, Sameline

VERSION 1 – REVIEW

REVIEWER	Abdulaziz Farooq Aspetar, Orthopaedic and Sports Medicine Hospital Qatar
REVIEW RETURNED	30-Jan-2020

GENERAL COMMENTS	<p>This paper is interesting and valuable to the current literature. Specially since it concerns a longitudinal follow up of adolescents over a 2 year period. A very studies have targeted this age group. Although many statistical analysis were performed it is not addressing a research question. And to begin with research question is not clearly stated.</p> <p>My suggestion is research question should be " Does PA measures at first year of high school predict changes in body composition parameters over years." PA was measured only once so it needs to be integrated into the research question. Unfortunately the abstract does not address this. The main drawback of the study is adolescents excluded due to missing data at follow up or baseline.</p> <p>Maybe children lost to follow up were more likely to be obese or more likely to be girls or boys and with certain important body composition parameter. This must be addressed before even proceeding with the data analysis which was performed with acceptable standard.</p> <p>The authors cannot make this conclusion "Objectively measured physical activity was not significantly associated with change in objectively measured BMI, waist circumference or FMI." at this stage.</p> <p>A better way to fix this to</p> <ol style="list-style-type: none">1. Include all participants with valid PA and Body composition at baseline.2. Compare groups (Group 1 valid data at two waves vs Group 2 valid data only at baseline). <p>look for all parameters listed in Table 1.</p>
-------------------------	--

	<p>3. If there is a significant associations, the conclusion stated is not acceptable. if there is no statistical significance then current conclusion is valid and acceptable.</p> <p>Now regarding the introduction and discussion. References are not up to date. For example only 2 references dated 2018 and 1 reference for 2019. There has been some extensive research on longitudinal studies of children and adolescents by</p> <p>Corder et al., Jago et al., Farooq et al.,</p> <p>etc.</p> <p>The authors repeated use the word "outcome, adjusting for outcome etc. but instead the specific parameter can be mentioned. Although authors acknowledge the limitation about the lost to follow up but this cannot justify not being able to study this in detail.</p> <p>I really enjoyed reading the paper but improvements can be made to English language and choice of words specially concerning exposure and outcomes. Here are some specific comments which could be helpful.</p> <p>Abstract</p> <p>Lines 2-5: Objective: The objective of the study is not stated in a way that can be described as aim of the study. For example instead of saying "This study explored" you could say, "aim of this study was to determine if...." So a research question has to be integrated within the objective. At present it only describes what you did.</p> <p>Line 6: Add number of adolescents (n=??) Add mean±SD for age.</p> <p>Line 7: No need to mention Fit Futures studies here. Since there is no introduction about the Fit Futures, the reader is not aware of this. It can be address in the methodology. Only sufficient at this stage is to mention over two years apart. Month and Years.</p> <p>Line 8: Add number of schools (Add randomly selected if that is the case). Northern should have N uppercase.</p> <p>Line 10: exposure and outcomes can be mentioned as physical activity and body composition.</p> <p>Lines 11-14: Move "Physical activity was measured..... activity" to section primary and secondary outcomes. Also if possible confirm that baseline and follow up measurements were approximately 2 years apart for each participant and it was at same time of the season every assessment.</p> <p>Page 5 Line 5: MVPA can be abbreviated much earlier, 6.4 minutes at baeline?</p>
--	---

	<p>Boys were more by 6.4 minutes? Kindly rewrite to make this sentence clear. Also add SD. For example, boys spent on average 6.4±SD more minutes compared to girls ($p<0.01$). The whole results section has to be rewritten: Outcome is “Changes in Body composition parameters” Exposure is not clear. Is it baseline PA or PA at follow up or changes in PA? Due this confusion, the results do not make sense.</p> <p>Page 9: Line 6: add month and year. The methods do not describe the level of sampling.</p> <p>First how were the school sampled. How many schools agreed to participate. (%)? Next how were the students sample from each school. What was the participate rate(%)</p> <p>From the methods it is clear that the criteria of selection was grade first year of upper secondary not less that 18 as the abstract mentions. Please be consistent.</p> <p>Page 10: Usually consent is needed for all ages <18. Not 16 as mentioned Page 13: Line 13: instead of outcome write body composition parameters.</p> <p>Lines 14-17. Some new measurements are appearing. Eating breakfast, time spent on TV. Etc.these can be introduce earlier.</p> <p>Page 14: Line 7: it means inclusion criteria was also children with valid pubertal status.</p> <p>Table 1: At the end. The proportion of minutes in MVPA/day can be changed to meeting MVPA guidelines per day. Also change syntax. It should be n(%) not %(n) for example instead of writing 20.5 (35) you could write. 35 (20.5%). It is only at this stage we learn that PA is only available at baseline. In abstract it is mentioned “Participants: Students participating in both studies and under the age of 18 at 11 baseline, and with valid measurement of both exposure and outcomes.” So the methods are quite inconsistent.</p>
--	--

REVIEWER	Mirko Brandes Leibniz Institute for Prevention Research and Epidemiology - BIPS GmbH, Germany
REVIEW RETURNED	27-Mar-2020

GENERAL COMMENTS	<p>Re 5: Research ethics: I only found very limited information on participant consent or no statement of ethics approval Re 12: Limitations: My major point of concern is the time range for this longitudinal study with respect to the research question. The time range between FF1 and FF2 is two years, and the participants were aged 16 at baseline. In my opinion, the decline of physical activity (PA) is already set (I assume the decline in PA is mostly seen between ages 10-16). Thus, all conclusions must be related to the (very small) time frame of 2 years. Moreover, you</p>
-------------------------	---

	<p>stated in the background that 50% of Norwegians 15 year olds meet the activity guidelines, and only ~22% did so in your data. Thus, I am very unsure how your findings will add to conclusions on youth in general. It might be only valid for that very specific population in your dataset.</p> <p>General comments: Strengths: I think that the authors did choose valid instruments for measuring PA, lean/fat mass and so on. Great job! Methods section: as school systems vary between countries, I would suggest to include the age in the text in the methods section, for example page 9, line 6: (n=1,117, aged 16 ± xy years) Utilizing appropriate cut-points for discriminating activity intensities is crucial when using accelerometers. Please justify why you used the Freedson cut-points for your age group. The common approach of summing up PA into the broad category of MVPA sums up all acceleration above 1951 CPM into one parameter. Did you consider to subdivide MVPA into three or four intensities, possibly discovering some correlations to BMI, fat/lean mass, changes in PA?</p> <p>Discussion/conclusion I would highly recommend addressing the time points of investigations, the amount of PA in your population and the overall number of participants in your study. To my mind, some conclusions are weak given the limitations above.</p>
--	--

VERSION 1 – AUTHOR RESPONSE

Reviewer #1:

Reviewer wrote:

The main drawback of the study is adolescents excluded due to missing data at follow up or baseline.

Maybe children lost to follow up were more likely to be obese or more likely to be girls or boys and with certain important body composition parameter. This must be addressed before even proceeding with the data analysis which was performed with acceptable standard.

The authors cannot make this conclusion "Objectively measured physical activity was not significantly associated with change in objectively measured BMI, waist circumference or FMI." at this stage.

A better way to fix this to

- 1. Include all participants with valid PA and Body composition at baseline.*
- 2. Compare groups (Group 1 valid data at two waves vs Group 2 valid data only at baseline). look for all parameters listed in Table 1.*
- 3. If there is a significant associations, the conclusion stated is not acceptable. if there is no statistical significance then current conclusion is valid and acceptable.*

Our response:

We agree that it is a weakness that we do not have data from follow-up for all participants who took part in the baseline examination.

There were 431 participants in Group 1 (included in present analyses) and 133 participants in Group 2 (valid data at baseline only) (54 girls and 79 boys). Boys in Group 2 had a significantly higher body weight, BMI, waist circumference, fat mass in kilograms and FMI than boys in Group 1. Minutes spent in vigorous activity was also significantly lower than in Group 1.

Girls in Group 2 (valid data at baseline only) had a significantly higher BMI, waist circumference, fat mass in kilograms and FMI than girls in Group 1. In addition, girls in Group 2 had significantly lower wear time, CPM, minutes in light activity, minutes in moderate activity and minutes spent in MVPA than girls in Group 1.

Thus, and as expected, participants in Group 1 (included in present analyses) and Group 2 (valid data only at baseline) differ in some relevant respects; boys and girls in Group 2 tend to be more obese and have lower physical activity.

However, we do not agree that this fact necessarily invalidates the conclusion that "Objectively measured physical activity was not significantly associated with change in objectively measured BMI, waist circumference or FMI." The more relevant question is whether the relationships between the physical activity at baseline and change in for example BMI differ in Group 1 (included in present analyses) and Group 2 (valid data only at baseline). This is, of course, not possible to know, but we see no reasons to believe that the beta-coefficients for the examined relationships differ much in the two groups of participants. Furthermore, Group 2 represents less than 25 % of all participants with valid measurements of physical activity and body composition at baseline (133 of 564 boys and girls). Therefore, the relationships in Group 2 must be very different from those in Group 1 if the relationships in all the 564 participants who part in the baseline examination (which we are not able to report) should differ much from the relationships in the 431 participants included in the analyses.

It is also a weakness that we lack valid data concerning physical activity at baseline for more than 200 subjects, but the same argument as above also applies when it comes to the implications of this for our results.

In the originally submitted manuscript, we noted (in the discussion): "We lacked complete data on physical activity and adjustment variables in 212 participants, but changes in BMI, waist circumference, FMI, LMI (except in girls, $p = 0.04$) and aLMI were not significantly different between those with- and without complete exposure data." We have now extended this discussion somewhat and added: "Furthermore, of those with valid data concerning both physical activity and body composition parameters at baseline, close to 25% did not attend the follow up." (See P. 18, lines 24-25 and P. 19, line 1).

Reviewer wrote:

Now regarding the introduction and discussion. References are not up to date. For example only 2 references dated 2018 and 1 reference for 2019. There has been some extensive research on longitudinal studies of children and adolescents by

*Corder et al.,
Jago et al.,
Farooq et al.,*

Our response:

The suggested references are highly relevant, and have been included in the manuscript as reference numbers 34, 35 and 44 (see P. 17, lines 10-14 and P. 19, line 4).

Reviewer wrote:

Lines 2-5:

Objective: The objective of the study is not stated in a way that can be described as aim of the study. For example instead of saying "This study explored" you could say, "aim of this study was to determine if...." So a research question has to be integrated within the objective. At present it only describes what you did.

Our response:

This is a good suggestion, and the sentence has been revised accordingly. See P. 3, lines 3-5.

Reviewer wrote:

Line 6:

Add number of adolescents (n=??)

Add mean±SD for age.

Our response: This is now included as suggested. See P. 3, lines 5-6.

Reviewer wrote:

Line 7: No need to mention Fit Futures studies here. Since there is no introduction about the Fit Futures, the reader is not aware of this. It can be address in the methodology. Only sufficient at this stage is to mention over two years apart. Month and Years.

Our response:

We acknowledge this point of view, but respectfully disagree. For us it seemed relevant to mention the Fit Futures study here, as the heading is «Design», and the studies are mentioned first in the title of the paper. As seen on P. 6, lines 11-16, the Fit Futures studies were performed over the course of some time, and thus the exact number of months between measurements varied slightly between participants. The mean number of days between measurements are nevertheless reported in the methods section (P. 9, line 14).

Reviewer wrote:

Line 8: Add number of schools (Add randomly selected if that is the case). Northern should have N uppercase.

Our response:

All eight schools in the neighbouring municipalities took part in the study. This has now been specified and the exact number of schools reported (see P. 3, lines 8-9).

Reviewer wrote:

Line 10: exposure and outcomes can be mentioned as physical activity and body composition.

Our response: The suggested changes have been performed (see P. 3, line 11).

Reviewer wrote:

Lines 11-14: Move “Physical activity was measured..... activity” to section primary and secondary outcomes.

Also if possible confirm that baseline and follow up measurements were approximately 2 years apart for each participant and it was at same time of the season every assessment.

Our response:

We agree that this particular section («Participants») is not the correct place to specify how physical activity was measured. To us it appears sufficient to say that physical activity was objectively measured (under the «Objectives» section), and then clarify further details in the methods section of the manuscript itself. It does not seem correct to place this information under «Primary- and secondary outcomes», since physical activity was an exposure and not an outcome.

Baseline and follow-up measurements were approximately two years apart (mean = 730 days, SD 74), which is specified in the manuscript (P. 9, line 14). Accordingly, the season would be the same, but with individual differences possible.

Reviewer wrote:

Page 5

Line 5:

MVPA can be abbreviated much earlier,

6.4 minutes at baeline?

Boys were more by 6.4 minutes?

Kindly rewrite to make this sentence clear.

Also add SD. For example, boys spent on average 6.4±SD more minutes compared to girls (p<0.01).

*The whole results section has to be rewritten:
Outcome is "Changes in Body composition parameters"
Exposure is not clear. Is it baseline PA or PA at follow up or changes in PA? Due this confusion, the results do not make sense.*

Our response:

We agree that this section had room for improvement, and have amended the text according to suggestions (P. 3, lines 17-23). One exception is the SD, which we did not include and instead added the 95% CI for difference as this seemed more informative to the reader. As we have removed the detailed section on PA measurements, this is the first section where MVPA is mentioned and thus abbreviated.

Reviewer wrote:

Page 9:

Line 6: add month and year.

Our response:

We prefer to report this in days, but have added SD for information (see P. 9, line 14).

Reviewer wrote:

The methods do not describe the level of sampling.

*First how were the school sampled. How many schools agreed to participate. (%)?
Next how were the students sample from each school. What was the participate rate(%)*

Our response:

Because all eight upper secondary high schools in the municipalities were invited and took part, school participation was 100%. The number of schools has now been specified on P. 6, lines 17-18. In our dataset, schools were anonymized, and thus we are not able to provide the participation rate from the individual schools.

Reviewer wrote:

From the methods it is clear that the criteria of selection was grade first year of upper secondary not less than 18 as the abstract mentions. Please be consistent.

Our response:

We agree that this might be confusing to the reader. Participation in the surveys were not restricted by age, but as the present study focused on body composition we excluded those aged ≥ 18 years since body composition arguably differs between adults and adolescents. This has now been specified on P. 6, lines 18-19.

Reviewer wrote:

Page 10:

Usually consent is needed for all ages <18. Not 16 as mentioned.

Our response:

In matters such as this, the requirement from the legal authority in Norway is age 16.

Reviewer wrote:

Page 13:

Line 13: instead of outcome write body composition parameters.

Our response:

The requested changes have been made throughout the manuscript.

Reviewer wrote:

Lines 14-17.

Some new measurements are appearing. Eating breakfast, time spent on TV. Etc. these can be introduced earlier.

Our response:

These measurements are now mentioned earlier, see P. 7, lines 2-4.

Reviewer wrote:

Page 14:

Line 7: it means inclusion criteria was also children with valid pubertal status.

Our response: This has now been clarified, see P. 14, lines 9-11.

Reviewer wrote:

Table 1:

At the end.

The proportion of minutes in MVPA/day can be changed to meeting MVPA guidelines per day. Also change syntax. It should be n(%) not %(n) for example instead of writing 20.5 (35) you could write. 35 (20.5%).

Our response: The requested changes have been carried out (See Table 1).

Reviewer wrote:

It is only at this stage we learn that PA is only available at baseline. In abstract it is mentioned "Participants: Students participating in both studies and under the age of 18 at 11 baseline, and with valid measurement of both exposure and outcomes." So the methods are quite inconsistent.

Our response: The abstract has been changed to overcome this limitation (P. 3, lines 3-4 and line 20), and the fact that PA was only available at baseline has now been specified on P. 8, lines 20-21.

Reviewer #2:

Reviewer wrote:

Re 5: Research ethics: I only found very limited information on participant consent or no statement of ethics approval

Our response: Participant consent is referred to on P. 7, lines 4-6, while ethics approval is referred to on P. 21, lines 1-2. If more comprehensive information is desirable, this can of course be included.

Reviewer wrote:

Re 12: Limitations: My major point of concern is the time range for this longitudinal study with respect to the research question. The time range between FF1 and FF2 is two years, and the participants were aged 16 at baseline. In my opinion, the decline of physical activity (PA) is already set (I assume the decline in PA is mostly seen between ages 10-16). Thus, all conclusions must be related to the (very small) time frame of 2 years. Moreover, you stated in the background that 50% of Norwegians 15 year olds meet the activity guidelines, and only ~22% did so in your data. Thus, I am very unsure how your findings will add to conclusions on youth in general. It might be only valid for that very specific population in your dataset.

Our response: It is correct that much of the decline in PA occurs prior to age 16, but further reductions take place also after the age of 16. The aim of the present study was not to assess changes in PA, but to assess whether a baseline measurement of PA predicted changes in measures of body composition. In this regard, we discuss the validity of a fluctuant behaviour such as PA in predicting changes in body composition. While follow-up data on objectively measured PA was not available, prior results from the same cohort indicate substantial changes in self-reported PA (reference number 36). The steeper decline during childhood has now been mentioned on P. 17, lines 10-12.

There are a number of possible explanations for the noted difference in percent of adolescents meeting the guidelines for MVPA. As you mention, much of the decline in PA occurs at younger ages, which would in part explain some of the observed difference as the participants in the other cited study were 15 years. Furthermore, in Norway, adolescents move from lower- to upper secondary high school in the year they turn 16. This transition may also trigger further reduction in PA, because many quit participation in organized sports at this time. Lastly, as you mention below, different cut-offs and wear-time algorithms may influence the amount of PA captured by accelerometers. Differences between studies in such strategic choices can lead to substantial differences in prevalence. Such differences add to the body of knowledge by illustrating how prevalence can vary substantially between ages, country and even within the same cohort as discussed by Van Hecke et al. (2016) (Van Hecke L et al. Int J Behav Nutr Phys Act. 2016;13:70. doi:10.1186/s12966-016-0396-4).

Reviewer wrote:

Methods section: as school systems vary between countries, I would suggest to include the age in the text in the methods section, for example page 9, line 6: (n=1,117, aged 16 ± xy years)

Our response:

This a valid point, but data on age for those that did not participate were not available. Also, because it is possible to attend upper secondary high school as an adult, a mean age would be slightly misleading. Because our focus was on adolescents, we excluded those aged ≥ 18 years at baseline (n = 38). The vast majority of participants were aged 16 years at baseline.

Reviewer wrote:

Utilizing appropriate cut-points for discriminating activity intensities is crucial when using accelerometers. Please justify why you used the Freedson cut-points for your age group.

Our response:

We used the Freedson cut-offs because they are one of the most widely used cut-offs, and bodily proportions and acceleration of a 16-year old resembles more an adult than a child. In addition, using the Freedson cut-offs facilitates direct comparisons in future studies following the same cohort as they have aged (See P. 8, lines 14-16).

Reviewer wrote:

The common approach of summing up PA into the broad category of MVPA sums up all acceleration above 1951 CPM into one parameter. Did you consider to subdivide MVPA into three or four intensities, possibly discovering some correlations to BMI, fat/lean mass, changes in PA?

Our response:

These are interesting questions, but we did not have any a-priori specific hypothesis as to how minutes spent in other subcategories of MVPA could affect measures of body composition. Furthermore, given the size of the cohort and the insignificant associations with MVPA (Table 4), we

do not have reason to suspect that such analyses would be substantially different from those reported.

Reviewer wrote:

Discussion/conclusion

I would highly recommend addressing the time points of investigations, the amount of PA in your population and the overall number of participants in your study. To my mind, some conclusions are weak given the limitations above.

Our response:

We believe that this has been addressed in the limitations and overall discussion. For instance we write “*Subjective judgement determines data management and analyses, e.g. the decision to exclude participants with wear time < 10 hours and < 4 consecutive days, is a trade-off between quality of data and the number of participants with valid data.*”.

Regarding the amount of PA in the population and the differences observed, a member of our research group has recently submitted an article, which has described the prevalence of those meeting MVPA recommendations in this particular cohort in greater detail, and we therefore prefer to not include a more thorough discussion on this matter in the present study. Should you be of the opinion that this is vital to the context of the manuscript in question, we will try to accommodate this request.

The limited time frame has been addressed in the limitations (See P. 19, lines 4-8).

Formatting amendments:

Tables citations should be in ascending order

Please review again the main document and ensure that all tables are cited in ascending order.

Please re-upload your supplementary files in PDF format

Our response:

As far as we can see, all the tables have been cited in ascending order. The supplementary files have been uploaded in PDF format.

VERSION 2 – REVIEW

REVIEWER	Abdulaziz Farooq Aspetatr, Orthopaedic and Sports Medicine Hospital, Doha-Qatar
REVIEW RETURNED	01-May-2020

GENERAL COMMENTS	<p>I am very much pleased with the newer version of the manuscript. The stated objective are more precise and along with methods section. I have few concerns that I believe are easy to accommodate.</p> <p>The abstract needs following changes. Instead of saying there was an association, please also add the direction of the association. For example, High Sed led to increase or decrease in</p> <p>"In girls there was a significant association between sedentary- and light activity and changes in lean mass index ($p < 0.01$) and appendicular lean mass index ($p = 0.05$)."</p> <p>Please change the final conclusion statement as follows</p>
-------------------------	---

	<p>Minutes spent in moderate-to-vigorous physical activity <at first year of upper secondary high school> was not associated with changes in either measure of body composition in neither boys nor girls either sex <after two years>.</p> <p>-----</p> <p>The results section is using the same style of communication. Significant associations and p-values. For example, is it not better to say, greater sedentary time at FF1 was associated with decrease in LMI ($p < 0.01$) and aLMI ($p = 0.05$) among girls.</p> <p>The present sentence written in results "there was a significant association between minutes spent in sedentary activity at baseline and changes in both LMI ($p < 0.01$) and aLMI ($p = 0.02$). " does not specify the direction of the association. All the results section uses p-values to communicate, which is boring to read. It says something interesting is happening but does not say what is happening.</p> <p>In discussion it says "In girls there was a weak association between minutes spent in sedentary- and light physical activity and changes in indices of lean mass. ". this is contradicting to the results section where we you have reported significant association with LMI and aLMI using Model 2 and Model 3. I think you meant to say, significant but small effect size.</p> <p>In the response to reviewers, the authors mention additional results comparing Group 1 (Not lost to follow up) and Group 2 (lost to follow up). Group 2 boys had higher BMI, WC, FMI and lower MVPA than Group 1. Group 2 girls were having higher BMI, WC, FMI and lower overall PA than Group 1. These are important results which can be included either in appendix or results section just before Table 1. This is good for your study, because this could explain the reason why you got weak associations although significant.</p> <p>Remember the objective of doing research to study the relationships (what happening) in the population, not what is happening in the sample. Therefore these results can explain your findings better and assist future researcher to approach similar designs with caution.</p> <p>You may find this request demanding, but kindly note this is the standard required as per the STROBE checklist on missing and lost to follow up cases.</p> <p>The response related to this in the response to reviewers can be moved to the limitation section of the manuscript as well.</p> <p>I think, if above changes are made, (1). The results section to speak about the direction of association and (2). Discuss the Group 1 and Group 2 results and support the conclusion.</p>
--	---

REVIEWER	<p>Mirko Brandes Leibniz Institute for Prevention Research and Epidemiology - BIPS GmbH Department of Prevention and Evaluation Unit Applied Health Intervention Research Achterstraße 30 28359 Bremen</p>
-----------------	---

	Germany
REVIEW RETURNED	20-May-2020

GENERAL COMMENTS	<p>Thank you for responding adequately to the comments of the first review process. Your answers sufficiently address the points raised by the reviewers, although there are still some discrepancies between the opinions of reviewers and authors. To my mind, this is an essential achievement of scientific discussion, thus I accept the justifications of the authors.</p> <p>The only point that is missing, is a clear statement that the study lost those adolescents with lower physical activity but higher BMI, waist circumference, fat mass,... from baseline to follow up. I can accept the authors view indicated in the response to reviewers, but to allow readers to make their own opinion on this fact, the information on how group 1 (complete data) and group 2 (only baseline data) differs should be included in the manuscript. I suggest to put it into the discussion, because this allows to also address the authors view on this (important) point. Otherwise, only the facts (differences in parameters between group 1 and 2) could be added to the limits section.</p>
-------------------------	---

VERSION 2 – AUTHOR RESPONSE

Reviewer #1:

Reviewer wrote:

The abstract needs following changes.

Instead of saying there was an association, please also add the direction of the association. For example, High Sed led to increase or decrease in ...

Our response:

The suggestion has been taken into account and revised. See. P. 3, lines 17-20.

Reviewer wrote:

Please change the final conclusion statement as follows Minutes spent in moderate-to-vigorous physical activity <at first year of upper secondary high school> was not associated with changes in either measure of body composition in neither boys nor girls either sex <after two years>.

Our response:

The suggestion has been taken into account and revised. See P. 3, line 23 and P. 4, lines 1-2.

Reviewer wrote:

The present sentence written in results "there was a significant association between minutes spent in sedentary activity at baseline and changes in both LMI ($p < 0.01$) and aLMI ($p = 0.02$). " does not specify the direction of the association. All the results section uses p-values to communicate, which is boring to read. It says something interesting is happening but does not say what is happening.

Our response:

We agree, and the suggestion has been taken into account and revised accordingly. See P. 11, line 12 and P. 12, line 1. Also P. 12, line 15 and P. 13, lines 1-2.

Reviewer wrote:

In discussion it says "In girls there was a weak association between minutes spent in sedentary- and light physical activity and changes in indices of lean mass. ". this is contradicting to the results section where we you have reported significant association with LMI and aLMI using Model 2 and Model 3. I think you meant to say, significant but small effect size.

Our response:

This has now been corrected. See P. 15, lines 11-12.

Reviewer wrote:

In the response to reviewers, the authors mention additional results comparing Group 1 (Not lost to follow up) and Group 2 (lost to follow up). Group 2 boys had higher BMI, WC, FMI and lower MVPA than Group 1.

Group 2 girls were having higher BMI, WC, FMI and lower overall PA than Group 1. These are important results which can be included either in appendix or results section just before Table 1. This is good for your study, because this could explain the reason why you got weak associations although significant.

Remember the objective of doing research to study the relationships (what happening) in the population, not what is happening in the sample. Therefore these results can explain your findings better and assist future researcher to approach similar designs with caution.

You may find this request demanding, but kindly note this is the standard required as per the STROBE checklist on missing and lost to follow up cases.

The response related to this in the response to reviewers can be moved to the limitation section of the manuscript as well.

Our response:

We agree that these results shed additional light on the findings and inform the reader. These findings have now been included in Appendix Table 1, and further elaborated in the limitations section as requested. See. P. 19, lines 5-12.

The STROBE checklist has also been updated to include this issue.

Reviewer #2:

Reviewer wrote:

The only point that is missing, is a clear statement that the study lost those adolescents with lower physical activity but higher BMI, waist circumference, fat mass,... from baseline to follow up. I can accept the authors view indicated in the response to reviewers, but to allow readers to make their own opinion on this fact, the information on how group 1 (complete data) and group 2 (only baseline data) differs should be included in the manuscript. I suggest to put it into the discussion, because this allows to also address the authors view on this (important) point. Otherwise, only the facts (differences in parameters between group 1 and 2) could be added to the limits section.

Our response:

We agree that this information is of value to the reader. As suggested by both reviewers, these findings are now provided in Appendix Table 1, with further elaboration on implications in the limits section. See. P. 19, lines 5-12.