Author's response to reviews

Title: Secular Trends: A Ten-Year Comparison of the Amount and Type of Physical Activity and Inactivity in Adolescents

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Author's response to reviews: see over
Secular Trends: A Ten-Year Comparison of the Amount and Structure of Physical Activity and Inactivity in Adolescents

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The authors thank the reviewers for their valuable and constructive comments. Revisions and changes have been undertaken to the satisfaction of the reviewers’ comments. The points in bold correspond with the comments made by the reviewers.

We hope that we have adequately dealt with the reviewers’ comments and that the manuscript can now be accepted for publication.

Best regards
Walid El Ansari
Professor

Reviewer's report 1

The primary aim of the study is to identify levels and secular trends of PA and physical inactivity behavior of adolescents in the Czech Republic. The research question is relevant for the field and the writing was acceptable. Data from the study is important since there is a paucity in the literature about activity and inactivity trends in countries of Central and Eastern Europe.

• We agree with and thank the reviewer

  a) Nonetheless, it is important to improve methods section, with a more detailed description of procedures for sample selection, it is not clear how adolescents were recruited, how representative is the sample?

  • This has now been amended. Some sentences have been added to the methods section to provide a detailed description of the procedures for sample selection, recruitment and representativeness (1st paragraph under the section ‘Participants’, p. 7, Line 2)

  b) What is the reason behind the use of two pedometer models?

  • This has a historical perspective. The first set of pedometers that our research team was provided with for monitoring physical activity was Omron pedometer (around 1996). Some years later (about 2005), the research team was involved in a multi-country study and a grant provided the Yamax pedometers. Hence in the current study, whilst the older cohort was measured by Omron, the younger cohort was measured by using wither of both pedometers. This historical point is not highlighted in the text.

  c) Are the results from those methods similar?

  • This has now been amended. Some sentences have been added to the methods section highlighting that the results from those methods are similar. A reference has also been
d) How the adolescents were asked about their activity or inactivity behavior? Although authors stated limitations around time estimation by adolescents, all the information related to activity and inactivity behavior rely on those individual chart sheets that need to be well described in the paper. The discussion and conclusions well balanced but is important to know how these data could be generalizable to Czech Republic.

• This has now been amended. Some sentences have been added to the end of the section ‘Assessment of physical activity and sedentary behaviour’ detailing and better describing how data was entered into the individual chart sheets (1st paragraph on p. 8, Line 22, just before the section ‘Statistical analysis’)

Other changes
In the light of the above amendments, new references have been added to the text and reference list and formatted accordingly.
We have now included an acknowledgement to the reviewers in recognition of their valuable and constructive comments.

Reviewer's report 2
The manuscript titled: "Secular Trends: A Ten-Year Comparison of the Amount and Structure of Physical Activity and Inactivity in Adolescents" suggests a relevant topic in the context of Human Biology. I will organize my comments into two groups. Firstly, the authors will contact with aspects that demand refinements.

A: QUESTIONS FOR REFINEMENTS

[A1] For several times the authors mention the younger cohort and the older cohort. It is somewhat confusing to read a manuscript that relates to growing years using the terms younger and older for portions of the databases (see page 5 - aims of the study). Actually, the sample was categorized in two groups 14-16 and 16-18.

• This has now been amended. Across the paper, the corresponding age brackets have now been added after the terms ‘younger adolescents’ or ‘older adolescents’ and corresponding year brackets after the terms ‘younger cohort’ or ‘older cohort’.

[A2] At the end of the second paragraph, I contacted with PA and PIA. Assume that PA is Physical Activity but at that moment I did not have any idea about the meaning of PIA

• This has now been amended. In the initial submission, PIA was used as an abbreviation for physical inactivity. Due to the recommendation of another reviewer, the term ‘physical inactivity (PIA)’ has now been removed from the paper and instead replaced by the term ‘sedentary behaviour’ which is now used across the paper.

[A3] Would be delighted to have a reference about the decision of excluding subjects based on the number of steps as stated in the top of page 7

• This has now been amended. A sentence and corresponding reference have now been inserted in support of the decision of excluding subjects based on the number of steps (p. 7, Line 26).
[A4] The section methods includes the "participants" as headline at the end of page 6, but the reader do not contact with the exact number of subjects in 1998-2000 and 2008-2010. This information should be in the text.

- **This has now been amended.** This information has now been added to the text highlighting the exact number of participants (p. 7, Line 22). Eligible data for analysis by gender, age groups and other variables are further detailed in Table 1 (p. 30).

[A5] Although it is possible to understand the symbols used to report males and females, I recommend the adoption of "males" and "females".

- **This has now been amended.** Across the paper, these symbols in the text have now been replaced by the terms boys and girls.

[A6] I am not sure with the style of BMC Public Health, but the manuscript may benefit if the authors assume the "report style" instead of "We" (as it is early page 8).

- **This has now been amended.** Across the paper, first person has been removed. All writing is now in the third person.

[A7] Too many tables and figures. A total of 8 for a descriptive study. The illustration may be more concise.

- **This has now been amended.** Two figures (initial figures 2 and 3) have now been deleted from the manuscript.

[A8] The format of the tables do not fit the tradition of journals.

- **This has now been amended.** All the tables have now been formatted according to the tradition of journal (pp. 30-35).

B: QUESTIONS CONSIDERED DIFFICULT TO BE SOLVED

[B1] In the abstract, specifically in the section "results" the authors stated: "Overweight and obesity in Czech adolescents ranges between 4-6%" Is this a population survey?

- **This has now been amended.** A sentence has now been added to the results section of the abstract indicating that these reported overweight and obesity levels are those of the study sample (p. 2).

[B2] Secular trends is a well known topic in Human Biology. It corresponds to responsiveness of human development to changes in the ecosystem. Therefore, it is important to state some social statistics that support the hypotheses. Birth rate, Longevity, degree of urbanization, unemployment rate, ration between <15 years and >65 years, number of cars per family, number of TV per family, number of computers per family, school dropout.

- **The primary aim of this study was to assess the secular changes in physical activity and sedentary behaviour of adolescents from 2 cohorts 10 years apart.** Whilst the requested information might be distally relevant to the topic, it does not lie within the scope of the paper. In addition, possibly, much of the requested information would not be nationally available for the older cohort (1998-2000).

In addition, we refer to recent published papers on secular trends (pls see the manuscript’s reference list for publication details). Raustorp & Ludvigsson 2007 (Secular trends of pedometer-determined physical activity in Swedish school children) reported secular trends but did not measure any of the requested variables. Similarly, Raustorp & Ekroth 2010 (Eight-year secular trends of pedometer-determined physical
activity in young Swedish adolescents) reported on secular trends without the measurement of any of the requested variables or similar variables. In addition, Moliner-Urdiales et al. 2010 (Secular trends in health-related physical fitness in Spanish adolescents: The AVENA and HELENA Studies) reported on secular trends without the measurement of any of the requested variables or similar variables.

However, in satisfaction to the reviewer’s comment, in the discussion section, we have now inserted data on the proportions of households in the Czech Republic with internet connections and proportions of households with computer across 2000 and 2009 (p. 20, Line 1)

[B2] Data collection occurred September, October, November, March, April, May, June. I believe that seasonal variation may correspond to a substantial confounding factor. Suppose that in late 90’s more subjects were reported in October and November and 10 years later more participants were monitored by May-June.

- We computed differences in number of steps according the seasons. There were no significant differences in number of steps achieved across seasons for both cohorts together (p=0.22). (p.10, Line 20)

[A3] What is the representativeness of the sample? From 1998-2000 to 2008-2010 the number of boys seems stable and ranged 209-201. However, the number of girls decreased from 311 to 181. With this limitation any significant difference between may be due to error sampling. In summary, the data is interesting but does not permits a secular trends analysis. I recommend the editor to combine my opinion with the one from other referee.

- This study is not a longitudinal monitoring of the same group of people across 2 time periods (1998-2000 and 2008-2010). Rather, it is the random selection of adolescents from two cohorts, each of which was monitored for 3 years (i.e. two independent groups). As such, the decrease in the number of girls is not foreseen to be a primary factor.

In addition, we refer to recent published papers on secular trends that also show a decrease/ different numbers of participants across the periods that were monitored/ measured (pls see above and also the manuscript’s reference list for publication details). For instance, Raustorp & Ludvigsson 2007 (Secular trends of pedometer-determined physical activity in Swedish school children) recruited and analyzed two cross-sectional cohorts of children 7–9 years of age carried out in October 2000 (336 children, 153 girls) and March/April 2006 (168 children, 83 girls). Similarly, Hardy et al. 2008 (examined secular trends among Australian adolescent) and recruited and analyzed two cross-sectional cohorts of children from grades 8 and 10 in year 1997 (grade 8 – 557 boys, 515 girls; grade 10 – 524 boys, 430 girls) and in year 2004 (grade 8 – 408 boys, 393 girls; grade 10 – 555 boys, 415 girls).


Quality of written English: Needs some language corrections before being published
This has now been amended. Across the paper, language corrections have now been double checked.
Other changes
In the light of the above amendments, new references have been added to the text and reference list and formatted accordingly.
We have now included an acknowledgement to the reviewers in recognition of their valuable and constructive comments.

Reviewer's report 3
This is an important and interesting study reporting on secular trends in overweight, physical activity and sedentary behaviour in an Eastern European country.

• We agree with and thank the reviewer

Discretionary Revisions
I would find it more logic if the older cohort would be presented before the younger cohort in all Tables and Figures, since we are looking at secular changes and tables are read from the left to the right.
• This has now been amended. All tables have now been amended accordingly (pp. 30, 32, 34).

Minor Essential Revisions
Abstract: last sentence methods: delete ‘to’
• This has now been amended (p. 2).

Abstract: results: “Regarding girls, only for the entire sample, these is a secular decrease in the duration of physical inactivity”: This is unclear: girls versus entire sample?
• This has now been amended. This sentence has now been clarified (pp. 2-3).

• This has now been amended (p. 3, Line 7).

Formulation of the 3 last objectives: It seems impossible to me to assess secular trends by cohort as differences between cohorts are investigated while assessing secular trends.
• This point has been clarified above. There exists a body of literature which assessed secular trends using comparison of two cohorts (younger and older) – 2 cross-sectional studies


For the self-reported measures, I would use the term “type” of activities instead of “structure”

- This has now been amended across the manuscript.

Please include where the pedometers were worn.

- This has now been amended. The information about where pedometers were worn has now been added (p. 8, Line 13).

Figure 2 and Table 3 completely overlap with Table 2. Figure 3 and Table 5 completely overlap with Table 4

- This has now been amended. Figures 2 and 3 of the initial submission have now been removed.

Total duration in the “comparison by structure” part of the table could be deleted as this is the same as duration of the whole week reported above.

- This has now been amended. This part of the table has been removed (pp. 32 and 34).

Use household or domestic instead of housework

- This has now been amended (p. 32).

P11: line 7: delete one ‘only’

- This has now been amended (p.14 , Line 1).

Results p 11: last line: only applicable to weekdays

- This has now been amended (p.14, Line 24).

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

The terms “physical inactivity” and “sedentary behaviour” are mixed up throughout the paper. In recent epidemiological studies a clear distinction is made between being “physically inactive” and being “sedentary”. I would recommend to replace the term “physical inactivity” by “sedentary behaviour”.

- This has now been amended. Across the manuscript, the term “physical inactivity” has been replaced by “sedentary behaviour”.

It is mentioned that cohorts were representative samples. Please add information regarding SES parents, education adolescents, ethnicity... to confirm the representativeness of the sample.

- The sample was selected on the basis of random sampling in order to provide an appropriate sample of Czech adolescents. Pupils participated in the study regardless of ethnicity, SES and education of parents. We do not have information about ethnicity, SES etc. of parents

In addition, we refer to recent published papers on secular trends (pls see the manuscript’s reference list for publication details). Raustorp & Ludvigsson 2007 *(Secular trends* of pedometer-determined physical activity in Swedish school children)
reported secular trends but did not measure any of the requested variables. Similarly, Raustorp & Ekroth 2010 (Eight-year secular trends of pedometer-determined physical activity in young Swedish adolescents) reported on secular trends without the measurement of any of the requested variables or similar variables. In addition, Moliner-Urdiales et al. 2010 (Secular trends in health-related physical fitness in Spanish adolescents: The AVENA and HELENA Studies) reported on secular trends without the measurement of any of the requested variables or similar variables.

Which sampling strategy was used? How were possible participants selected and contacted?
• This has now been amended. Some sentences have been added to the methods section to provide a detailed description of the procedures for sample selection, recruitment and representativeness (1st paragraph under the section ‘Participants’, p. 7)

What was the response rate?
• This has now been amended. The response rate was 94%; this has now been clarified in the text (2nd paragraph under the section ‘Participants’, p. 7, Line 24), and also in the discussion (p. 15, Line 21).

Why were two different types of pedometers used?
• This has a historical perspective. The first set of pedometers that our research team was provided with for monitoring physical activity was Omron pedometer (around 1996). Some years later (about 2005), the research team was involved in a multi-country study and a grant provided the Yamax pedometers. Hence in the current study, whilst the older cohort was measured by Omron, the younger cohort was measured by using either of both pedometers. This historical point is not highlighted in the text.

Please provide information about the correspondence between both types. How similar are measures assessed by both pedometers?
• This has now been amended. More information has been detailed about the correspondence between both types of pedometers and the similarity of the measures assessed by both pedometers. A reference has also been added in support (p. 8, Line 19).

I suppose adolescents had to remove the pedometer for water-based activities such as swimming, waterpolo... and contact sports such as judo where safety regulations prohibit activity-monitors. This was not mentioned in the methods section. And how did you deal with this non-wearing activity time. Were steps added to account for this?
• No steps were added for the above mentioned activities. This point has now been highlighted to the limitations section (p. 20, Line 23). However, these types of physical activities were not discounted: they have been included and recorded in the charts in relation to the duration of self-reported physical activities.

Was the use of the chart sheet to assess PA and sedentary behaviour validated?
• This has now been amended. More detail and information about the chart has now been inserted in the text. Two additional references have also been inserted in support (p. 9, Line 3).
As adolescents were supposed to wear the pedometer for at least 10 hours, I suppose adolescents had to record the point of time they put the pedometer on in the morning and when they removed it to sleep on the chart sheet? Did they also have to record the point of time when the pedometer was removed during daytime and the point of time they put them back on and the reason for removing it? Please explain more.

- This has now been amended. The adolescents were informed to wear the pedometer for the whole day (at least 10 hours). More information has now been added to the text (pp.8 and 20).

How many participants had to be deleted from the data file due to insufficient wearing time per day (at least 10 hours)? And due to insufficient number of wearing days (at least 7 days)?

- In total, 1,479 adolescents participated in the study (response rate was 94%). About 39% (n=577) participants had incomplete or incorrect data (e.g. missing weight, height, age, or mean daily steps count of >30,000 or <1,000) and were excluded from the analysis (p.7, Line 26).

However, due the time frame of the study (about 10 years), we do not currently have the information on the number of participants excluded from the analysis by reason for exclusion. i.e. How many participants had to be deleted from the data file due to insufficient wearing time per day (at least 10 hours)?; and due to insufficient number of wearing days (at least 7 days)?

In the methods section it should be reported that height and weight was assessed using self-report by the adolescents. The definition of underweight, normal weight, overweight and obese should also be mentioned in the methods section. In Table 1 these definitions are mentioned between brackets, but these are the definitions used in adults. In children age and gender specific BMI cut offs should be used to define weight status. To define overweight and obesity in children it is recommended to use the IOTF cut points.

As a result of using the wrong cut offs for overweight and obesity, prevalence data are not correct.

- This has now been amended. New computations have now been undertaken using the cut-off points as recommended Cole et al. (2000) and supported by IOTF, upon which the IOTF cut points are premised. The proportion overweight and obesity in Czech adolescents have now been correctly amended, according to cut off points recommended by Cole et al. (2000) (Table 1, p. 30).

Please report the self-reported (instead of objectively measured) height and weight as a limitation of the study in the discussion.

- This has now been amended. This point has now been highlighted in the limitations section (p. 21, Line 6).

The description of the Anova tests is confusing. It seems like week and weekend days will be compared; boys and girls will be compared and cohorts will be compared. But in fact cohorts are being compared separately for both genders and age groups.

- This has now been amended. The text in the section ‘Statistical analysis’ has now been changed accordingly. New computations were undertaken. In addition, a new table has also been constructed to highlight interactions (p.11, Line 1).
Instead of performing repeated univariate analyses, it would be stronger to perform 2x2x2 multivariate analyses. This would also allow to study interaction effects.

- **This has now been amended.** Pls see point above. a new table has also been constructed to highlight interactions (p. 31). The interactions are also now highlighted in the abstract (p.3, Line 12), results (p. 11), discussion (p.17, Line 20) and conclusion sections (p.22, Line 9).

Why were non-parametric Kruskal-Wallis tests used to assess secular trends in the self-reported data? I suppose non-normal distribution might be the reason. But analyses of variance have been shown to be very robust for non-normality. The disadvantage of using non-parametric statistics is the greater chance of type II errors (and it does not allow to test a multivariate model including the study of interaction effects).

- **The main reason for using Kruskal-Wallis test was non-normal distributions of all the self-reported data (e.g. durations of physical activity and sedentary, etc). This point has now been amended and a sentence in the text in the methods section has been inserted in the section ‘Statistical analysis’ (p. 9).**

Please add statistics for all comparisons in Table 1.

- **This has now been amended in Table 1 (p. 30).**

Please be careful not to interpret the direction of change of non-significant differences in Table 2 and 4. There are many effect sizes with low increase of decrease as interpretation, while p>0.05.

- **This has now been amended. Interpretations were corrected.**

The first paragraph of the description of Table 4 is weird. Some general results are summarized, while between brackets it is clarified whether this finding is applicable to boys or girls, which is a bit strange. If it is only applicable to one gender, why not including these results in the next paragraph where gender specific results are discussed?

- **This has now been amended. General information for boys and girls has now been moved according to the recommendation (pp. 13-14).**

Why are the recommendations for daily steps lower in the Czech Republic?

- **This has now been amended.** The recommendations for Czech adolescent were created before the year 2000. New knowledge about physical activity behaviour could contribute to new, more valid recommendations for Czech adolescents. A sentence highlighting this point has now been inserted in the limitations section (p. 21, Line 6).

Although pedometers provide objective measures of physical activity, some call pedometers semi-objective if step counts have to be registered by the participants and pedometers are not blinded. This should be included as a limitation in the discussion.

- **This has now been amended.** A sentence highlighting these points has now been inserted in the limitations section (p. 21, Line 5).

The discussion and conclusions will have to be adapted in accordance with changes in results based on some of the above mentioned remarks.

- **This has now been amended.** The discussion and conclusions have been amended accordingly

**Statistical review:** Yes, and I have assessed the statistics in my report.
Other changes
In the light of the above amendments, new references have been added to the text and reference list and formatted accordingly.
We have now included an acknowledgement to the reviewers in recognition of their valuable and constructive comments.