Reviewer's report

Title: Accumulation of lifestyle and psychosocial problems and persistence of adverse lifestyle over two-year follow-up among Finnish adolescents

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Reviewer: Yang GAO

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General comments:
This article aims to 1) identify potential groups of adolescents based on their similarities of psychosocial and lifestyle factors, which may be useful to tailor more inclusive health promotion programs in the future, and 2) examine whether unhealthy behaviours would persist or not with a two-year follow-up. This study is relevant to the current public health problem among adolescents. The latent class analysis (LCA) is an appropriate statistical method to address the first study aim and was done properly. However, I do not suggest you consider it for publication due to the following considerations:

Major compulsory revisions:
1. The abstract does not reflect the main text properly, especially the “Results” part. For example, in the abstract, the authors state that “Different combinations of adverse lifestyle and psychosocial symptoms were relatively common in both sexes (49% of boys and 33.5% of girls)”. However, I cannot find “(49% of boys and 33.5% of girls)” in the full text at all.
2. Re-write the “Methods” and “Results” parts of the main text to make them concise. Their format looks more like “thesis” than “journal article” style.
3. The LCA identified four groups and one of them is “obese” in both boys and girls. Eating behaviour, which is highly related with obesity and may contribute more to obesity (especially in girls) than PA, is not involved in this study. Therefore, the authors should discuss the possible influence of eating habits on the group identification. For example, if it is possible that the “obese” group separated from the “sedentary” group is at least partially due to the unknown eating behaviour?
4. Tables 2.1 and 2.2: add in the categorical variable of body weight (normal, overweight); add a column of “number” for each existing column (e.g. the number of all subjects and that of subjects in each group by different variables).
5. The second aim of this study is to test the persistence of unhealthy behaviours. To do so, the authors should focus on changes in behaviours. However, the authors failed to address this study aim in results and discussion part. For example, in boys, obesity prevalence rate decreased, whilst smoking rate increased (more than double of that at 16) in the “obese” group (Figure 1). The authors failed to point it out in the “Results” part, nor interpreted it in
“Discussion”. One suggestion is, adolescents in that group should be paid more attention on their smoking behaviours, as they are most likely to engage in smoking in the period of 16-18 years old, compared to other groups.

Minor Essential revisions:
1. 2nd sentence, 4th paragraph, Background: explain why simultaneously considering both psychosocial and lifestyle perspectives is superior to considering them separately. As that would reflect the value of this study.
2. In the “Lifestyle variables” subheading, Methods: physical activity levels (PA) were measured during “outside school hours”. No information about PA at school, including PA at PE classes and in sports teams organised within school. That may have biased the classification of PA levels and further biased the study results. Thus, the authors should discuss its possible influences on the study.
3. About the “smoking” variable, “Lifestyle variables” subheading, Methods: generally, 1 pack-year equals to 20 cigarettes every day for one year. Why “15 cigarettes/day” was adopted in this study?
4. About the “BMI” variable, “Lifestyle variables” subheading, Methods: give the percentage of subjects whose height and weight were self-reported.
5. In the “psychosocial variables” subheading, Methods: add the following information: 1) how many items does the YSR have? 2) the exact figures of the YSR’s validity and reliability reported in Ref 52; 3) the subscales No. 4-6 in the YSR, how did you deal with them when you re-grouped them into “internalizing” and “externalizing” groups.
6. Last three sentences, the “psychosocial variables” subheading, Methods: the authors used “the mean item value of the particular scale” to substitute the missing values in other cases. Is it not a method of imputation? If yes, correct the last sentence.
7. 2nd sentence, 2nd paragraph, “strengths and weeknesses” subheading, Discussion: explain what bias (in which direction) the under report or over report would result in?
8. Select the references and ideally keep the number of references no more than 30.

Discretionary revisions:
1. 2nd sentence, 1st paragraph, “Lifestyle variables” subheading, Methods: the 3rd category of PA should be 2 hours or less.
2. About the “smoking” variable, “Lifestyle variables” subheading, Methods: “… pack- year is equivalent to 15 cigarettes smoked per day per year” should be “… pack-year is equivalent to 15 cigarettes smoked per day for a year”.
3. About the “BMI” variable, “Lifestyle variables” subheading, Methods: give the unit of BMI, kg/m2.
4. Last sentence, the “psychosocial variables” subheading, Methods: “In other case” should be “In other cases”.
5. The second last sentence, 4th paragraph, Results: “being overweight/obese” should be “with higher BMI”.
6. The 1st sentence, 3rd paragraph, Discussion: “Surpringly” should be “surprisingly”.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Needs some language corrections before being published

**Statistical review:** Yes, and I have assessed the statistics in my report.

**Declaration of competing interests:**
I declare that I have no competing interests.