Author’s response to reviews

Title: Seasonality of physical activity and its association with socioeconomic and health factors among urban-dwelling adults of Kaunas, Lithuania

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Author’s response to reviews:

Responses to Reviewers’ Comments

We greatly appreciate the time and efforts by the editor and reviewers in reviewing this manuscript. We believe that their vital comments and suggestions have contributed substantially to improve the manuscript and that the revised version can meet the journal publication requirements.

The changed and added texts in the revised manuscript are shown in yellow. The reviewers’ comments are reproduced here in italics and the page and line number that he/she uses refer to the original paper and not the revised manuscript.
Reviewer 1 Comments to Authors.

Dear manuscript authors,

This paper presents and analysed the associations of environmental, socioeconomic and health determinants with physical activity levels among adults depending on the employment status in urban population.

Title of the article reflects the content of the article in question and the target population.

Introduction of manuscript, clear, it contains the problems of the topic.

Methodology chapter is written well and clearly reflects the use of research methods used in an analysed topics and using standardised world recognised research methodology. In this cross-sectional study based on telephone interviews were included 1,111 cases. Used statistical research methods are good to achieve aim of the study. Please clarify the description and evaluation of obesity. In the Methodology section, authors could provide more detailed information about the other covariate's as socioeconomic factors, chronic diseases status, and car disposal variable. Please provide number and percentage of adults (18> years) and in the analysed age groups in Kaunas by statistical department in 01 01 2017. In the methods chapter (in Table 1), the authors of the manuscript could also present climatic indicators for the summer and winter seasons separately during 1981-2010 by mean values in Kaunas. It would be good to know from the authors of manuscript whether the testing for normality of the analysed data was performed.

The data described in the results section to provide correctly and clearly. All analysed data are presented in tables. The results section first presents the general characteristics of the study population in the socio-demographic, economic factors and some health outcomes. In Table 3 and 4, the authors of the manuscript present the distribution of physical activity according to socio-demographic, economic and health factors during the summer and winter seasons by employment status. Analysed data show that the unemployed had significantly more chronic health problems than those who work. It would be good for the authors of the manuscript to provide statistical significance based on the existence of chronic health problems between these groups, as well as on other analysed variables in the relevant groups. Table 5 shows possibility of sufficient physical activity depending various socio-demographical, economical and health outcomes in winter and summer seasons. The authors of manuscript found that unemployment was statistically significantly associated with increased possibility to reach sufficient physical activity compared to working people in summer, but not in winter and car disposal and overweight significantly decreased possibility to reach sufficient physical activity during summer and winter season. It would be worthwhile to adjusting the data in multivariate logistic regression based on the availability of chronic diseases during the study.
Discussion of the results quite long, covering the matters dealt with an extensive data obtained are compared with data obtained by other researchers, they are quite clear in understanding and interpreting their possible connections. In this section, authors of manuscript provide discussion about levels of physical activity and some socio-demographic, socioeconomic factors, life styles factors and health determinants, discrepancies between physical activity in different seasons and the above mentioned variables, their influence to physical activity levels, explained situations and interactions. Discussion section could be shortened. Good, that authors of manuscript in this section provide limitations of the work, which may have influenced the results obtained and provided the strengths of this study.

Conclusion is suitable and reflect of aim.

Bibliography section includes 30 literature sources, which corresponds to source citation regulation. Some of references provided in the bibliography are not cited in the manuscript text (29, 30).

Figures and tables names are suitable, but some information in the tables and figures would be corrected (descriptions of variables) and added (no some abbreviation).

Response to the Reviewer 1 Comments:

We greatly appreciate the Reviewer’s efforts to carefully review the paper, valuable suggestions and comments that helped us to improve the quality of the manuscript.

According to the reviewer’s comments, we have clarified the description and evaluation of obesity in the Study design and study population subsection of the Methods section (please see page 6, lines 125-127; refers to the revised manuscript):

“To assess the prevalence of obesity, it was defined as a BMI greater than or equal to 30.0 kg/m2. BMI was examined as a continuous variable (kg/m2) and as a categorical variable with two groups: non-obese (< 30 kg/m2) and obese (≥ 30 kg/m2).”

We agree with the Reviewer that a more detailed description of variables that were used as covariates in the analyses is necessary. We provided more detailed information about socioeconomic factors, chronic diseases, car disposal and other characteristics of the study participants in the Study design and study population subsection of the Methods section (please see pages 5-6; refers to the revised manuscript).
As suggested by the reviewer, we have also provided the proportion of adults (≥18 y) in our analysed age groups from the entire population of Kaunas by the Lithuanian Department of Statistics in 01 01 2017 (please see page 9, lines 183-190; refers to the revised manuscript):

“According to the data of the Lithuanian Department of Statistics, the median age of the population of Kaunas in 2017, was 42 years, women comprised a larger proportion of the population compared to men, respectively 56.2% and 43.8%. Based on the data of Statistics Lithuania, the proportion of the entire population in each age group is: 43.1 % (18-44 years), 32.1 % (45-64 years) and 24.8 % (≥65 years). The first two age groups are slightly different from the groups that were analysed in this study because the Lithuanian Department of Statistics provides data for these specific age groups, however the age distribution of the entire population is similar to our sample.”

As suggested by the reviewer, we have presented available climatic data for summer and winter seasons separately during 1981-2010 in Kaunas (please see Table 1, in the Methods section).

Regarding the normality test, the data was tested by the Shapiro–Wilk normality test using SPSS software.

We agree with the reviewer that it would be worthwhile to adjust the data for chronic disease and, in a statistical analysis, we investigated the effect of chronic disease on the possibility of achieving sufficient physical activity, and although there was a tendency for adults with chronic illness to have a higher possibility of achieving a sufficient level of physical activity, especially during the summer, but this relationship was not statistically significant. According to the reviewer’s suggestion, we included a chronic disease variable as a covariate in the multivariate logistic regression (please see Table 5, in the Results section).

We checked references and their citation in the text and in the bibliography.

The information and abbreviations in the tables regarding variables have been clarified with more detailed description of them in the methods section.
Reviewer 2 Comments to Authors.

PEER REVIEWER ASSESSMENTS:

OBJECTIVE - Full research articles: is there a clear objective that addresses a testable research question(s) (brief or other article types: is there a clear objective)?

Yes - there is a clear objective

DESIGN - Is the current approach (including controls and analysis protocols) appropriate for the objective?

Yes - the approach is appropriate

EXECUTION - Are the experiments and analyses performed with technical rigor to allow confidence in the results?

Yes - experiments and analyses were performed appropriately

Statistics - Is the use of statistics in the manuscript appropriate?

Yes - appropriate statistical analyses have been used in the study

INTERPRETATION - Is the current interpretation/discussion of the results reasonable and not overstated?

Yes - the author's interpretation is reasonable

OVERALL MANUSCRIPT POTENTIAL - Is the current version of this work technically sound? If not, can revisions be made to make the work technically sound?

Yes - current version is technically sound
GENERAL COMMENTS: This is a well written and conducted study. The objectives are clear, the analysis is thorough and the work is well presented. I commend the authors.

ADDITIONAL REQUESTS/SUGGESTIONS: My only comments are that the introduction needs some editing. It is unnecessarily long-winded. Further the findings are only of modest interest and probably only relevant to Lithuania. I would suggest that the detailed restating of results in discussion is not necessary. The results should be discussed in reference to other findings. This also applies to the conclusion and only a summary statement is required. Limitations should also include a statement that sample sizes was limited in some subgroups as reflected by wide confidence intervals and that the cross-sectional nature of the design precludes the examination of causality.

Response to Reviewer 2 Comments:

We greatly appreciate the reviewer’s helpful comments and valuable suggestions to improve the manuscript. The decline in physical activity is a key public health concern, therefore it is important to understand how individual characteristics such as demographics, socioeconomics, health and lifestyle affect the level of physical activity depending on seasonality. The use of passive modes of commuting has also been associated with declining levels of physical activity, therefore sustainable transport strategies, such as those aiming to increase walking and cycling, is relevant in order to promote physical activity. However, many European cities, as well as Kaunas, are facing challenges of sustainable mobility and difficulties to promote active transport such as walking and cycling, also to encourage integration of multiple active transport modes. The aim of this study was to investigate the key factors associated with seasonal levels of physical activity among adults by the employment status.

According to the reviewer’s comments, the introduction section was carefully revised and improved. We deleted some unnecessary sentences and we tried to highlight the importance of this research. Also, the introduction section was supplemented with additional references and information on previous studies examining the link between socioeconomic factors, especially employment status, and physical activity to reveal existing knowledge.
According to the reviewer’s suggestion, we deleted restatements of results in the discussion and conclusions sections. We revised the results and discussion sections and discussed the results of the study in reference to findings from other studies.

As suggested by the reviewer, we revised and improved the conclusion section. We deleted the repetition of the results and tried to summarize the main findings and emphasise implications for policy and practice.

In the last paragraph of the discussion section, we added limitations regarding limited sample size in some subgroups and that it is difficult to derive causal relationships from cross-sectional as suggested by the reviewer (please see pages 16-17, lines 328-331; refers to the revised manuscript).

Reviewer 3 Comments to Authors.

Seasonality of physical activity of Kaunas (Lithuania) urban population in association with employment status, socioeconomic and health factors

General

The study set out to investigate a relevant topic on physical activity levels and their relation to employment, socioeconomic and health variables among urban dwellers in Kaunas using a cross-sectional data. Whilst the background information, the methods section needs much to be desired. I have various comment to further help improve the quality of the draft before it could be published in a high quality/impact journal like the BMC Public Health.

Response to Reviewer 3 Comments:

We highly appreciate the reviewers’ insightful and helpful comments to improve the manuscript.
Reviewer comment:

Title

Employment is a key economic activity which is subsumed by socioeconomic status measurement. Authors are therefore urged to modify their title into the following:

Seasonality of physical activity and its association with socioeconomic and health factors among urban-dwelling adults of Kaunas, Lithuania

Response:

Thank you for your suggestion of the title. We agree with the reviewer about the title and changed it as suggested to “Seasonality of physical activity and its association with socioeconomic and health factors among urban-dwelling adults of Kaunas, Lithuania”.

Reviewer comment:

Background

Page 3 line 49 should be referenced appropriately.

On page 3 line 50, "Further, researchers have proved that moderate and vigorous-intensity PA improves health..." requires more references.

Response:

Thank you for your comments and suggestions. We have added additional references on page 3 lines 49 and 51 (refers to the revised manuscript). Please see the list below:


Reviewer comment:

Page 3 line 52 gives statistics of the uptake of PA among adolescents. I challenge the authors to provide more and general picture of the situation since the study population goes beyond adolescents. Again it would great if the authors provide an idea about why the acceptance and participation of PA is on the low among populations.

Response:

Thank you for your comment. It is very important for us, as the reviewer have noted, to investigate why people’s physical activity is constantly decreasing, therefore we try to provide general view of the population as there is evidence that physical activity begins to decline at adolescence. Based on these evidences, we have written in the manuscript:

“According to the World Health Organization (WHO), globally, 1 in 4 adults is not active enough, more than 80% of the world’s adolescent population is insufficiently physically active and only one third of the EU inhabitants satisfy minimum recommendations of the World Health Organization according to which adults aged 18–64 should do at least 150 minutes of moderate-intensity aerobic PA throughout a week.6, 7

Global decline in PA is attributed to economic development, with the subsequent increase in urbanization and communication technologies.8 Lack of PA during leisure time and sedentary behaviour at work and home have been associated with decline in PA.9 Likewise, an increase in the use of passive modes of transportation also contributes to insufficient PA.10 With economic growth, increasing number of people and vehicles in urban areas public lifestyle becomes less active.”

A variety of variables play a role in determining physical activity levels from demographic variables such as age and gender, to psychosocial and environmental variables. We believe that the main reasons why levels of physical activity are low is improving people’s quality of life, the transition towards more sedentary occupations and personal motorised transportation, the use of more time-consuming technology, whose development has limited physical activity and
increased the amount of time spent sitting. The use of passive modes of transport has also been associated with declining levels of physical activity, especially in urban areas.

As suggested by the reviewer, we provided these reasons in the Introduction section.

Reviewer comment:

The relations between PA and employment are just subtly delivered. A strong interrelationships between these are critical in the background.

Response:

Thank you for your comment and suggestion. We provided more information on previous studies examining the link between socioeconomic factors, especially employment status, and physical activity to reveal interrelationships between these variables and the existing knowledge (please see pages 3-4, lines 65-86; refers to the revised manuscript):

“Previous studies have showed the association between PA and sociodemographic and socioeconomic factors.14, 15 Beenackers et al. found that in studies reporting occupational PA, individuals in lower socioeconomic groups were more active, whereas the results were opposite for leisure-time PA, which showed that higher socioeconomic groups were more likely to be physically active in their leisure-time than lower socioeconomic groups.15 Meanwhile, inconsistent results were found in terms of commuting PA and socioeconomic status.15 There is also some evidence that full-time employment is positively associated with PA among men and job type has a major impact on PA levels in both genders.16 Salmon et al. found that less-skilled workers, homemakers and those in lower status occupations were less likely to report leisure-time PA.17 Other studies have reported opposite results with less-skilled and full-time workers as more active.18, 19 Work-related PA has health benefits, but it is less beneficial than aerobic physical exercise during leisure time.20, 21 Endurance capacity, which is particularly important with regard to preventing noncommunicable diseases, improves during aerobic leisure activities.22 However, only high levels of PA during leisure time, as well as the increase in time spent in active commuting can actually compensate for the negative effects of prolonged sitting, but these levels of leisure time PA are often not achieved.23, 24 Mitsui et al. showed that male office workers in a rural town are more active on non-working days than on working days during summer, with an inverse pattern in the winter season.25 However, other studies conducted in urban areas have found different patterns that the level of activities is lower on non-working days than during working days and people’s participation in these activities are limited to professional work and daily duties related activities.26, 27 These findings indicate that employment status is an important factor in assessing physical activity.”
Reviewer comment:

The theoretical foundations of this study is generally weak and need to be sharpened.

Importantly, the problem formulation on which this study is based is weak.

The authors agree to the view that an extent research abound articulating these relationships, yet they failed to educate their readers about why this study is timely. A much more definition of the problem is required.

Response:

In this emerging world of technology, we become less physically active. The main idea of the article is to investigate the main factors that influence levels of physical activity, considering seasonality, highlighting the importance of employment status, as well as determining the most significant differences between these groups.

In the manuscript, we tried to adjust comments by the reviewer. We provided more detailed information on the existing knowledge on this topic, stated the problem of this study more clearly and tried to highlight the importance of this study and what it adds to the body of existing knowledge in the introduction section.

Reviewer comment:

Methods

The methods of this study has several flaws which make the credibility of the findings compromised and questionable.

What was the sampling frame for this study? How did you select participants? Authors claim that a market research agency conducted the survey. Your audience would want know more about this survey, the purposes of it and how data were obtained. What were the inclusion and exclusion criteria? How was the telephone interview done? How were contact numbers obtained to facilitate the telephone interview? How many potential respondents declined and what was the participation rate? How did authors claim the sample was representative when we are not told about the study population and also applied just a convenience sampling? Please do justify the selection of the study communities. Why only urban areas? These are critical issues of great concern and must be addressed.
Response:

Kaunas was selected for this study as the second largest city in Lithuania with a population of 292,691 inhabitants. This study is a part of the researcher groups’ project titled “The impact of sustainable mobility, physical activity and environmental factors on urban population health” that is carried out in Kaunas and funded by the Research Council of Lithuania.

In addition, the city of Kaunas is currently developing a Sustainable Urban Mobility Plan and it is potentially important to increase the understanding of active mobility among adults.

A cross-sectional study of a random sampling was performed to select participants from the entire population of Kaunas city residents in the study. The aim of this survey was to determine the habits of physical activity and mobility considering seasonality, demographic, socioeconomic, health and lifestyle factors of Kaunas city residents. This survey was based on standardized questionnaire and conducted as a part of our project that was mentioned above (“The impact of sustainable mobility, physical activity and environmental factors on urban population health”). A market research agency that has previously conducted similar surveys conducted the fieldwork. As this agency has many years of experience and regularly conducts surveys, it has a large database of individuals, including the telephone numbers of these individuals. Participants were interviewed by telephone from September to November 2017. To ensure that the sample of the study would be as close as possible to the entire population, a representative sample size was calculated depending on the confidence level and the margin of error and the number of at least 1000 respondents was set. The participation rate was 57 percent. Sample size was 1,111 adults who completed the questionnaire. The inclusion criteria: males and females aged 18 years and over, who were permanent residents of the city and gave informed consent, were included in the study. The exclusion criteria: individuals under the age of 18, temporary residents were excluded from the study.

The survey was conducted by calling phones, explaining about the ongoing project that was mention above, its aim and objectives, asking if a person agrees to answer the questionnaire, which takes no longer than 15 minutes. The sample of the study was conducted with survey respondents who answered the phone and responded to questions. Then the SPSS database was created.

According to the United Nations, today 55% of the world’s population lives in urban areas, a proportion that is expected to increase to 68% by 2050, therefore the focus of our study was to
determine the levels of physical activity depending on seasonality and by individuals’ characteristics in urban areas, particularly in the city of Kaunas.

We have also included additional information in the Methods section.

Reviewer comment:
On page 5, line 109, do not start a sentence with figures. This is wrong in academic writing.
Response:
Thank you for your comment. We corrected the sentence to “We included 1,111 adults who completed the questionnaire.” (please see page 5, line 106; refers to the revised manuscript)

Reviewer comment:
Page 5 line 114-115, "…and other variables" What are those variables? Note that every variable included in the analysis should be identified, operationalised and justifications provided for why they were considered.
Response:
Thank you for your comment. We described and explained each variable included in the analysis in the Study design and study population subsection of the Methods section (please see pages 5-6, lines 108-110 and 115-136; refers to the revised manuscript). In the text, we have also distinguished and highlighted the demographic, socioeconomic and health-related variables and the outcome to make clearer and easier to understand.

Reviewer comment:
Page 5 line 115-116, which existing/validated questionnaires were used? And which specific projects objectives? Detail of the scales adopted/adapted should be provided and referenced appropriately.
Response:
Thank you for your comment. General and specific questionnaires were used to evaluate demographic and health determinants, physical activity and lifestyle behaviour. Scientific literature was reviewed and questions from existing and approved questionnaires were selected, some questions were adapted to the specific objectives of our project that is related with physical
activity and sustainable mobility, seasonality and health. Questionnaires from the National Health Interview Survey (NHIS), designed by the National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention (CDC) were used to evaluate demographic and health determinants. The Global Physical Activity Questionnaire developed by the World Health Organization (WHO) was used to collect information about physical activity at work and during leisure time and travel behaviour.

We included this information in the manuscript and described in more detail the variables that were used in the analysis (please see page 5, lines 111-114; refers to the revised manuscript).

Reviewer comment:

Page 5, Line 116, "the questionnaire was…” is a repetition. This statement has been made on line 107 and therefore needs to be reconciled.

Response:

Thank you for your comment. We changed these sentences and removed a repetition.

Reviewer comment:

What constituted the outcome variable, the explanatory variables and the confounding variables in this analysis? These details description of these are required to allow reader understand what you wanted to do.

Response:

The dependent variable (the outcome) of this study was the level of physical activity defined as walking and cycling during weekdays and weekends and sufficient physical activity (150 min/week and more) recommended by the World Health Organization. The independent variables were demographic (age, gender, marital status, children), socioeconomic (employment status, educational level, income, car disposal), health factors (BMI, chronic disease, smoking, alcohol consumption). Employment status was one of the main independent variables for physical activity. Multiple independent variables were included in the logistic regression model, and the odds ratios were presented of each independent variable after adjusting for the effects of other variables in the model. All the confounders were independent of each other.

We have included this information in the statistical analysis section in the manuscript (please see page 7, lines 155-159; refers to the revised manuscript):
“The dependent variable (the outcome) in this study is a categorical variable indicating the level of physical activity and sufficient physical activity (150 min/week and more). The independent variables were demographic (age, gender, marital status, children), socioeconomic (employment status, educational level, income, car disposal), health factors (BMI, chronic disease, smoking, alcohol consumption).”

Reviewer comment:

The key variables of this study were not mentioned and their measurements missing. What health-related variables were included as stated in the title? How were health, socioeconomic, and confounding variables operationalised?

Response:

Body mass index, obesity, chronic disease, smoking and alcohol consumption were considered as health-related variables and were included in the analysis. Health was operationalized by body mass index, obesity, chronic disease, smoking and alcohol consumption. Socioeconomic factors were operationally defined in this study as: employment status, educational level, income and car disposal. We included more detailed description of these variables in the Study design and study population subsection in the Methods section (please see pages 5-7, lines 115-143; refers to the revised manuscript).

“Socioeconomic factors. Educational level was classified as low education (12 or fewer years), medium (non-university) and high education (university degree). According to the employment status, participants of the study were classified into two groups: workers and unemployed individuals. Income was divided into two groups: lower- and middle-income (≤ 1000 Eur) and upper-income (> 1000 Eur). The income classification is based on a measure of income per person.

Participants were asked in the questionnaire if they had a car at their disposal to determine if car ownership is associated with less frequent active transport and less PA.

Health-related variables. In the questionnaire, participants were asked if they had been diagnosed with a chronic illness by a doctor to assess the prevalence of chronic disease. In order to calculate body mass index (BMI), each participant was asked about their weight and height. BMI was calculated as the ratio of weight (kg) to height squared (m2). To assess the prevalence of obesity, it was defined as a BMI greater than or equal to 30.0 kg/m2. BMI was examined as a continuous variable (kg/m2) and as a categorical variable with two groups: non-obese (< 30 kg/m2) and obese (≥ 30 kg/m2).
Participants were classified into two smoking categories: current smokers and non-smokers. Alcohol consumption was examined as a categorical variable with two groups: non-drinkers and drinkers.

Demographic factors. Age was used as a categorical variable and divided into three groups: 1) \( \leq 45\) years old, 2) 46-64 years old and 3) \( \geq 65\) years old. Participants were classified into four marital status groups – married, divorced, single and widowed. Adults with children were analysed in this study and two groups were examined: those adults with one or more child under the age of 18 (< 18 y) were coded as yes and those who do not have a child or have one or more child over the age of 18 were coded as no.

Outcome. Commuting PA on weekdays and weekends during summer and winter were analysed. The subjects were asked whether they walked, rode a bicycle, or used motorized transportation to and from work or other frequently visited location as well as the daily duration of these activities. The daily commuting PA was categorized into two categories: using motorized transportation or walking or cycling for 0 to 29 min; and walking or cycling for 30 min or more. Sufficient physical activity (at least 150 min of PA per week) was assessed based on questions about the duration of daily physical activity.”

Also, we provided more detailed information and description of these variables in the Statistical analysis subsection (please see pages 7-8, lines 155-169; refers to the revised manuscript) and in the Results section when providing the results of multivariable logistic regression analysis in Table 5.

Reviewer comment:

The assessment of the PA is problematic. Just asking respondents about whether they walked etc. without indicating the frequency or the number of times they engaged in those physical activities cannot measure PA. More importantly, PA should be a conscious action based on upright psychological frame. The fact that some walked to work does not mean they engaged in PA. Authors should look for and read how PA is measured, eg. See Global Physical Activity Scale/Questionnaire: https://www.who.int/ncds/surveillance/steps/resources/GPAQ_Analysis_Guide.pdf, General Practice Physical Activity Questionnaire: https://www.gov.uk/government/publications/general-practice-physical-activity-questionnaire-gppaq

Response:
Thank you for your comment. The questionnaire that was used in our study to evaluate physical activity was based on the Global Physical Activity Questionnaire developed by the World Health Organization (WHO) that the reviewer referred to. We have provided this information in the Methods section. This questionnaire allowed to collect information about physical activity during weekdays and weekends and travel behaviour. In the questionnaire, participants were asked about their physical activity at work and during leisure time and there were also separate questions about the duration (minutes per day) of walking and cycling and the intensity of these physical activities.

According to the reviewer’s comment, the description of physical activity assessment in the Methods section was also revised and clarified (please see pages 6-7, lines 137-143; refers to the revised manuscript).

Reviewer comment:

The description of the study area, the indication of geographical extents and land size, do not provide the reader anything that relate to the core tenet of the study and therefore remain redundant. The information in Table 1 is not needed and should cut.

Response:

Thank you for the comment and suggestion. One of the purposes of our study was to explore the effect of season on the levels of physical activity, because there is evidence that levels of physical activity vary with seasonality. Based on the comments of the other reviewer, the information in Table 1 was supplemented with climatic data separately during the summer and winter seasons allowing a better understanding of the climate and weather conditions in the country where the study was conducted. We hope that the revised table provides more information and can help the reader to get a better picture of the climate in Lithuania as the article also examines seasonal differences in physical activity levels.

Reviewer comment:

It is difficult to follow through the statistical analysis subsection of the methods when the variables of interest were not measured/assessed. How and why did authors follow the Jakel and colleagues analytical framework? Chi-Square test for proportions? Or you meant categorical variables? The statement about missing data on page 7, line 150-151 is confused and carried no meaning. Authors should come again. Why did the authors decide to dichotomize the PA? What was the theoretical bases for this since such action will only exclude the intervening information of the variable and therefore provide misleading results? Why did the authors decide to control for employment, BMI education, income, alcohol intake, etc?
Response:

Thank you for your comments and suggestions. We followed Jekel and colleagues’ statistical book, because it introduces statistical methods that are used in epidemiology and public health studies, principles of research designs, data types, tests of statistical significance and procedures for multivariable analysis.

In the statistical analysis, we used chi-square test for categorical variables. We have clarified this information in the manuscript to “chi-square test (for categorical variables)” (please see page 8, line 160; refers to the revised manuscript).

Regarding the statement about missing data, we agree with the reviewer that this statement is not necessary, and we removed it from the manuscript.

We have selected to use a categorical variable of PA and dichotomized it according to the recommended levels of physical activity for adults developed by the World Health Organization (https://www.who.int/dietphysicalactivity/publications/recommendations18_64yearsold/en/), because we thought that it could give the best results in terms of the purpose of this study. These recommendations are relevant to all healthy adults aged 18–64 years and are applicable for all adults irrespective of gender, race, ethnicity or income level. Another reason why we chose to use a categorical variable is that it improves communication among researchers, clinicians and policy-makers by making results more interpretable and easier to understand.

Multivariable logistic regression was used to assess the association between the prevalence of sPA in the summer and winter and socioeconomic, health-related and demographic variables. Multiple independent variables such as employment status, educational level, income, car disposal, BMI (continuous variable), chronic disease, smoking exposure, alcohol consumption, age, gender, marital status, minor children (continuous variable) were entered into a model. The adjusted odds ratios (aORs) were presented of each independent variable after adjusting for the effects of other independent variables in the model. Statistical significance was set at p < 0.05.

We have clarified the statistical analysis subsection in the manuscript (please see pages 7-8, lines 155-170; refers to the revised manuscript).

Reviewer comment:

Page 7 line 142-145, why did the authors decided to retain only those variables that were significant in the subsequent multivariate models? This is a flop and has not theoretical/statistical underpinnings.

Response:
Thank you for your comment. We decided to keep a variable in the model based on the statistical significance, according to the scientific literature and those that changed the adjusted odds ratios (aOR) by 10% or more. Although, some methodologists suggest inclusion of all relevant variables in the model regardless of their significance in order to control for confounding, however, this approach can lead to large standard errors. First, we selected the variables significant in univariate analysis according to a chosen p-value (<0.05). Any variable that were significant at 0.05 level were included in the multivariate analysis. Covariates were removed from the model if they were non-significant and not a confounder.

We have clarified the statistical analysis subsection in the manuscript (please see page 8, lines 163-170; refers to the revised manuscript).

Reviewer comment:

Results and discussion

The missing data shown in Table 2 which apparently are all zeros should be excluded.

Response:

Thank you for your comment. We removed the information about missing data in Table 2 as suggested by the reviewer and left only a sample number where it was lower due to the unanswered question (income and BMI variables).

Reviewer comment:

Page 11, line 192, the adjusted odds ratios for what? As it stands now, it is difficult to isolate the exposure variables from the covariates. This makes it difficult to follow through what the authors did and what why want to communicate. The presentation of the results thereof appears confused.

Response:

We apologize for the confusion presenting the results of multivariable logistic regression analysis. We have revised the sentence in Page 11, line 192 (page numbers refer to original manuscript).

We have also updated the Table 5 with additional information on the socioeconomic, health-related and demographic variables used in the analysis and included information on the adjustment in footnotes. Each independent variable was adjusted for all the other independent variables.
The Results section was also revised and improved to represent the results more clearly and comprehensively.

Reviewer comment:

Author should tighten the discussion and the conclusions of this paper properly and improve the discussion on the policy implications of such practices.

Perhaps, for this journal, some more discussion of the policy and practice implications of this research would be useful.

These sections lack a nuanced interpretation and explanation of the findings.

Response:

Thank you for the comment. We have revised and improved the discussion section. We have deleted repetitions of results in the discussion and conclusions sections. We extended the discussion with the findings from other studies and tried to provide deeper understanding and insights into study results. Also, as suggested by the reviewer, we have improved the discussion and conclusions sections on the policy and practice implications. Although, we have given a little less attention to the policy implications of such practice in this study, but rather focus on the relationship between seasonal physical activity and socioeconomic, health and other factors but we think that future research oriented towards a more political context would be highly appreciated and necessary.

Reviewer comment:

A citations are generally needed for the various factual statements provided throughout the manuscript.

Response:

Thank you for the comment. According to the reviewer’s comment, we have carefully revised the manuscript and added citations where they were needed.
Reviewer comment:

Proofreading and editing is necessary throughout to make the manuscript easier to read. The manuscript is full of grammatical errors which thwarts the intended meaning of what the authors seek to communicate. The quality of writing is also poor and the writing appears rushed.

Response:

Thank you for your comment and suggestion. We are sorry for this inconvenience. The manuscript has been carefully revised to improve the grammar and readability.