Author’s response to reviews

Title: Differences in health-related quality of life between three clusters of physical activity, sitting time, depression, anxiety, and stress

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Author's response to reviews: see over
Dear Prof Buchowski,

We would like to thank you for the opportunity to resubmit the revised manuscript, “Differences in health-related quality of life between three clusters of physical activity sitting time depression anxiety and stress” (MS: 1782584346132439). We appreciate the reviewers’ comments and believe that the suggested revisions have improved the manuscript. Enclosed is a revised version of the manuscript and our detailed response to each reviewer comment. We have also included the updated affiliation for one co-author (MJD). Thanks again for your time and consideration.

Sincerely,

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Please change the affiliation for the following co-author:

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Authors’ responses to reviewer comments regarding:

Differences in health-related quality of life between three clusters of physical activity sitting time depression anxiety and stress (MS: 1782584346132439)

Revisions in blue font

Editorial request:
1. Please update your ethics statement to include the name of the ethics committee that approved your study.

*We specified the name of the local ethics committee as requested.*

**Methods (p. 4):** “Study procedures were approved by the Central Queensland University Human Research Ethics Committee.”

**Ronald Plotnikoff’s report:**

Thank you for allowing me to review this paper. This is a well-written paper on an interesting and salient issue related to public health. The statistical approach for these cross-sectional data is quite novel and the results are interesting.

**Points to consider in improving the paper (Minor Essential Revisions):**

1. Would it not make more sense to make the cut-points/categories based on clinical/and or public health guidelines? If not, I would suggest including a rationale as to why the categories were based on ‘below average’ and ‘above average’ scores.

   *A strength of the applied analytic strategy is that the scores representative of each category are not based on any cut-offs but rather reflect the ‘typical’ individual in that cluster profile based on continuous data at the individual level. After reviewing the manuscript, we can see how our description of the results is misleading in this regard. We have clarified this by revising how the cluster subgroup profiles were described and by revising the data analyses section (please see response to comment 3).*

   **One example of the revisions:**

   **Results (p. 7):** “The first cluster (higher psychological stress) represented a small portion of the sample (n = 129, 13%) and was representative of people with moderate amounts of (i.e., near sample average) physical activity (Mz = 0.25, 66 min/day) and sitting time (Mz = -0.23, 8.96 hr/day), but higher (i.e., above average) depression (Mz = 1.91), anxiety (Mz = 1.91), and stress (Mz = 1.81). The second cluster (higher amounts of sitting time) represented the largest portion of the sample (n = 456, 45%). It was representative of people with moderate physical activity (Mz = -0.12 = 46.29 min/day), higher sitting time (Mz = 0.83 = 12.71 hr/day), and moderate depression (Mz = -0.40), anxiety (Mz = -0.36), and stress (Mz = -0.38). The third cluster (lower amounts of sitting time) represented the second largest portion of the sample (n = 429, 42%), and it was representative of people with moderate physical activity levels (Mz = 0.05 = 46.29 min/day), lower amounts of sitting time (Mz = -0.82 = 6.88 hr/day), and moderate depression (Mz = -0.15), anxiety (Mz = -0.19), and stress (Mz = -0.14).”

2. Provide information as to how ‘generalizable’ the study sample is to the adult Australian population.

   *We included a statement describing the generalizability of the study sample to the conclusions section.*
Discussion (p. 10): “The findings of this study generalize to a community Australian sample with fairly low psychological distress, high amounts of physical activity, and modest amounts of sitting time.”

3. Data Analyses: To help readers, it would be beneficial to provide a little more detail (with simple) wording to explain the analyses of Aim 1 (cluster analysis).

   We included a simple description of cluster analysis in the data analysis section with a citation to a user-friendly guide to the method.

   Methods (p. 6): “A two-step cluster analysis [37, 38] of Z-scores of physical activity, sitting time, depression, anxiety, and stress was conducted in R version 2.15 [39] to partition participants into subgroups of similar behavioural-mental health profiles. Cluster analysis creates groups in which the values of a set of variables for individuals in the same group are more similar to each other than to those of individuals in the other groups [40].”


4. I think the first part of the paper could be made a little clearer. It took a couple of reads to fully comprehend things.

   We revised the introduction to make it more comprehensible:

   One example of the revisions:
   Introduction (p. 3): “Psychological distress (i.e., depression, anxiety, stress symptoms), physical inactivity, and high amounts of sitting time are burdensome for health [1–3] and quality of life [4–7]. To this point, the research conducted on these topics has either focused on behaviour or psychological distress, but in reality, these constructs do not exist in isolation, but rather as an aspect of a person’s multifaceted behavioural-psychological profile [8].”

5. The authors may want to add to the discussion section – that future prospective designs could further explore the relationships amongst these constructs.

   We appreciate the comment and have included this important point in the discussion.

   Discussion (p.10): “Prospective studies further investigating the relationships between these constructs will help untangle the time ordering of these effects, and interventions targeting physical health status and quality of life may benefit from promoting reductions of people’s sitting time.”

Editorial:


   We made the revisions.
Methods (p. 5) “Time spent in each of these activities was truncated to 14 hours per week and total activity time was truncated to 28 hours per week [29].”

7. Page 8 lines 3-5. There appears to be a word or two missing in this sentence.

We revised the sentences.

Results (pp. 7-8): “The higher amounts of sitting time cluster had significantly lower physical HRQoL than the higher psychological stress cluster (95% CI of difference = -2.39 – -0.07) and the lower amounts of sitting time cluster (95% CI of difference = -1.44 – -0.66). Based on the population norms, these group differences have effect sizes of $d = .12$ and $d = .04$, respectively [36].

8. Page 4 (line 12) The aim states identifying population subgroups with different behavioral profiles, while Page 8 line 4 in the Discussion states the aim is to identify subgroups of people with similar profiles. This needs to be clarified/made consistent.

We restated the aim in both places (and one more time in the methods section) for clarification and consistency.

Introduction (p. 4): “The first aim was to identify population subgroups represented by behavioural (i.e., physical activity, sitting time) and psychological (i.e., depression, anxiety, and stress) profiles.”

Discussion (p. 8): “The aims of this paper were to (1) identify subgroups of people represented by behavioural-psychological profiles...”

9. Discussion. A number of the sentences begin with the word “That”. I believe these particular sentences could be reworded to improve readability/grammar.

We revised several sentences in the discussion to improve readability, as suggested.

Examples:

Discussion (p. 8): “That The subgroup representative of high psychological distress was not profiled as physically inactive, which seems contrary to the typically low rates of physical activity typically found in populations with mental health problems [9–11].”

Discussion (p. 9): “Contrary to previous research showing that mental health problems are detrimental to quality of life and wellbeing [6, 7], That the subgroup with high psychological distress did not significantly differ in mental HRQoL from the other two subgroups in the present study.”

Discussion (pp. 9-10): “That The subgroup with high amounts of sitting time had poorer physical HRQoL than the other subgroups, supporting this growing body of evidence linking sitting time with detrimental health.”

Maciej Buchowski’s report
Minor Essential Revisions:
1. The authors did not assess occupation related physical activity. It should be included in study limitations.

   We added a discussion of this study limitation and highlighted important related directions for future research.

   Discussion (p. 10): “Additionally, physical activity was assessed with a self-report measure that did not account for occupational physical activity, so future research is needed to determine whether the findings differ when objective assessment of behaviour or self-report measures more inclusive of multiple domains of physical activity are utilised.”

2. It is unclear if the AAS was validated in men.

   We clarified that the measure has been validated in men and women samples (see Brown et al., 2004 reference # 31).

   Methods (p. 5): “Previous research has demonstrated this measure has acceptable reliability and validity in adult men and women [30, 31].”

Minor Discretionary Revisions
3. Conclusions. Lines 16-17: Interventions should consider that (1) “treatment effectiveness may vary as a function of these behavioural and mental health profile…” This statement, especially if it stands alone, is imprecise and should be edited for clarity.

   We appreciate that the reviewer pointed out this over-speculation and have reigned in our conclusive statement.

   Abstract (p. 2): “Conclusions: Interventions should consider that (1) physical activity, sitting time, and psychological distress are aspects of multifaceted behavioural-psychological profiles, and (2) reductions of sitting time may have major impacts for physical health-related quality of life.”

4. Page 4, Line 13: “high levels of sitting time”. The authors should consider using term “higher amount” or “longer sitting time”

   We appreciate the suggestions and agree that “higher amount of sitting time” is better terminology. We revised these phrasing throughout the manuscript.

   Introduction (p. 4): “It was hypothesized that higher amounts of sitting time and lower amounts of physical activity would group together with higher levels of depression, anxiety, and stress.”

5. Page 5, Line 2: Were there any known differences between responders and non-responders?
There was no data available for non-responders, so we were unable to test whether they systematically differed from the responders. We included these sentiments into the limitations section.

Discussion (p. 10): “Study participants were voluntarily involved in a web-based survey, so it may be that the sample was highly motivated; however no information was available on non-respondents so it was not possible to test for differences between those who did and did not respond to the survey.”