Author's response to reviews

Title: Awareness of physical activity in healthy middle-aged adults: A cross-sectional study of associations with sociodemographic, biological, behavioural, and psychological factors.

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Author's response to reviews: see over
Dear Dr. Stacy Clemes,

Thank you very much for the invitation to revise and resubmit our manuscript, *Awareness of physical activity in healthy middle-aged adults: A cross-sectional study of associations with sociodemographic, biological, behavioural, and psychological factors* (manuscript ID: 8293346861206360).

Attached you will find a revised manuscript and our response to each point raised by the reviewers is below. We would like to thank both reviewers for their positive feedback. The comments and suggestions they provided have helped to strengthen the paper, and we hope that you find the revision suitable for publication in *BMC Public Health*.

Please do not hesitate to contact me if you require further information. We look forward to hearing from you.

Yours faithfully, and on behalf of all authors,

Job G Godino, PhD
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Referee 1 (Lillian Lechner)

Minor Revisions

1) I do not see sufficient reason for testing two separate models in Table 2. It could well be that some of the differences found in Model 2 are influences by the differences from Model 1. By not correcting for these differences in Model 2, there is a substantial chance that differences found were not related to misperceiving physical activity, but to differences in characteristics from Model 1 (especially the socio demographic factors). Why not present an overall model? I doubt that the reference of Bauman provides enough solid ground for these complete separate models.

Our rational for testing the models separately was that we wanted to distinguish between proximal and distal correlates of awareness of physical activity, but we did not want to include variables that were hypothesised to be on the causal pathway between the more distal factors and awareness of physical activity. We included the Bauman et al. reference to clarify the concept of mediation in the context of understanding influences on physical activity. We have clarified this on page 4, lines 231 to 234, which now state, "To distinguish associations between proximal and distal factors and to avoid overadjustment (i.e., the inclusion of variables hypothesised to be on the causal pathway), the psychological variables were modelled separately from the sociodemographic, biological, and behavioural variables.” Our second reason for testing separate models was to remain consistent with previous research in this area, which similarly distinguished psychological factors from sociodemographic and biological factors.

2) In the discussion it is stated that very little is known about the effects of personalised feedback on awareness of physical activity, intention and behaviour. However, there have been several RCT’s who explicitly focussed on changing health behaviour through explicitly increasing awareness of health risk behaviours, for physical activity (e.g. Van Stralen ea, 2011) as well as for other health behaviours.

Reference


We agree that this was an oversight. We have changed the sentence on page 7, lines 389 to 396, which now reads, "However, studies of the effects of personalised feedback on awareness of physical activity, intention to increase physical activity, and behaviour have been limited by small sample sizes and imprecise outcome measurement, and large randomised controlled trials with objective outcome assessment would advance research in this area [42–45].” We have also included the suggested citation, as well as citations from Marcus et al., Kroeze et al., and Smeets et al.

Referee 2 (Emily Knox)

Minor Revisions

1) Introduction Pg2 Ln 60-62: “According to national and international guidelines....” The author’s need to acknowledge that the guidelines at the time this research was conducted have since been adapted and current guidelines now state ‘150 minutes/week’.
We agree and the sentence on page 2, lines 59 to 62, now reads, “According to previous national and international guidelines, adults should accumulate at least 30 minutes of moderate to vigorous physical activity on 5 or more days of the week in order to derive such benefits (current guidelines encourage adults to engage in moderate-intensity aerobic physical activity for at least 150 minutes per week).” We have also included an appropriate reference.

2) Pg 2 Line 83: The distinction between self-reported physical activity as assessed using a questionnaire and awareness of physical activity i.e. whether an individual perceives their activity to be sufficient or not should be discussed as it could be misinterpreted that misperception is the same as over/underreporting. The difference between the two should be explicitly highlighted.

We agree and have added the following clarifying sentences on page 2, lines 81 to 89:

“Awareness of physical activity has previously been defined as the agreement between self-rated and actual levels of physical activity. Self-rated physical activity is assessed by asking individuals to provide a single evaluation of the quantity of physical activity they engage in (e.g., “active” or “inactive”). Actual levels of physical activity are assessed using either a self-reported measure (e.g., a physical activity questionnaire) or an objective measure (e.g., an accelerometer), both of which result in a quantified level of physical activity. It is important to highlight that the discrepancy assessed in measures of awareness of physical activity represents the accuracy of an individual’s belief about whether or not their level of physical activity is adequate, and is distinct from determining error or validity when comparing self-reported and objective measures.”

3) Pg 2 Line 84: This sentence needs restructuring. Currently with the way it reads you almost ask why improve awareness when overestimators have better health outcomes....

We agree and the sentence on page 2, lines 92 to 95, now reads, “Although their inactivity places them at increased risk of a variety of chronic diseases and disorders [1], overestimators tend to have more favourable health characteristics compared to those who are realistic about their inactivity [15–17].”

4) Pg2 Line 104: “we assessed awareness of physical in a...” need to add activity.

This has been corrected.

5) Pg2 Line 108: “A deeper understanding of the factors... important for understanding”. Understanding is important for understanding... Change this sentence.

The sentence on page 2, lines 129 to 131, now reads, “A deeper understanding of the factors associated with misperception could be important for determining why individuals choose to be active or inactive and might inform the development of effective strategies for promoting physical activity.”

6) Methods Pg 3 Line 133: “did not provided at least...” should read did not provide at least

This has been corrected.

7) Pg 5 Line 220: “misperceived their physical activity by incorrectly reporting that they were not meeting the guidelines”. This needs to be phrased differently as it may be confusing due to the fact that self-reported physical activity was also measured. ‘Reporting’ should perhaps be avoided, or it should be explicitly stated at the beginning that when ‘reporting’ is referred to this means the awareness item not the self-report.

This has been corrected.
We agree and have avoided the use of “report”, “reported”, or “reporting” throughout. The only exception is now “self-report” used in reference to a self-reported questionnaire.

8) Pg 5 Line 233: “more future-oriented”. Reword as ‘more oriented towards making goals for the future’.

This has been reworded as suggested.

9) Pg 6 Line 285: “their overweight status”... This needs to be explained further. Was this group more overweight? I am not clear why this group is at a greater risk and need our attention as in this case they were healthier and were more active than accurate inactives.

We agree and have clarified our statements on page 6, lines 358 to 371:

“It is important to highlight that although overestimators appear to be healthier than those who are realistic about their inactivity, on average they were overweight and their physical activity level was inadequate. This places them at increased health risk, which may be worsened by their inaccurate belief that they do enough physical activity to stay healthy. Overestimators are also less inclined to believe that physical activity has beneficial effects, and they express less intention to increase their physical activity than those who are realistic about their inactivity...within the framework of health behaviour theory, each of these findings suggest that overestimators are less likely to increase their physical activity than realistic inactives...”

Major Revisions

1) General comment: The author’s need to explicitly differentiate between self-report and awareness. The difference between misperception and inaccurately self-reporting physical activity needs to be explicitly discussed to ensure confusion is avoided. The author’s also need to be more careful throughout in the terms they use when referring to misperception and should steer clear from the word ‘reporting’ when discussing misperception as this could be confused as inaccurate reporting. If self-reported physical activity was not actually used (see specific comment 9) then deleting it altogether will help prevent confusion.

We agree and have added the following clarifying sentences on page 2, lines 81 to 89:

“Awareness of physical activity has previously been defined as the agreement between self-rated and actual levels of physical activity. Self-rated physical activity is assessed by asking individuals to provide a single evaluation of the quantity of physical activity they engage in (e.g., “active” or “inactive”). Actual levels of physical activity are assessed using either a self-reported measure (e.g., a physical activity questionnaire) or an objective measure (e.g., an accelerometer), both of which result in a quantified physical activity level. It is important to highlight that the discrepancy assessed in measures of awareness of physical activity represents the accuracy of an individual’s belief about whether or not their level of physical activity is adequate, and is distinct from determining error or validity when comparing self-reported and objective measures.”

As suggested, we also have avoided the use of "report", "reported", or "reporting" throughout the manuscript, and we feel that this has greatly reduced the possibility for confusion.

2) General comment: The practical application of your findings should be better explored in the discussion. Physical activity guidelines are population-wide and so what does this mean for population attempts to change behaviour?
We agree and have added the following sentences on page 7, lines 424 to 429:

“Our results imply that public health messages aimed at promoting physical activity among the general population are unlikely to reach inactive adults who believe their level of physical activity is adequate. Increasing awareness of physical activity and adapting public health messages to underscore that relatively healthy, normal weight and overweight individuals who are moderately active can still garner health benefits from increasing their physical activity to the recommend level may be important in promoting physical activity.”

3) Methods Pg 3 Line 146: For those who did not provide a full week of accelerometer data it is not clear how the determination of whether they met guidelines was made. This needs to be explained. Also, you need to give your criteria for a valid day and week. Was PAL calculated using only one 24hr period? If so you need to explain what 24 hr period was selected and why only 24 hr was used?

We agree and have clarified our statements on page 3, lines, 167 to 173:

“Physical activity level (PAL) was calculated as the ratio of total energy expenditure in a 24-hour period to basal metabolic rate. The average PAL over each day that a participant wore a monitor was calculated for participants who wore a monitor on three or more days and had at least 72 hours of complete data. The objectively measured average PAL was used in the assessment of awareness of physical activity (explained in detail below).”

We have also clarified our statements on page 4, lines 210 to 214:

“We then classified participants’ objective physical activity as either inactive (PAL < 1.7) or active (PAL > 1.7) in line with physical activity guidelines [2, 3]. An habitual PAL > 1.7 is associated with reduced risk of overweight, obesity, type 2 diabetes, and cardiovascular disease, and is approximately equivalent to 30 minutes of moderate to vigorous physical activity per day at least 5 days of the week [3].”

4) Pg 3 Line 151: Having individual’s complete a self-reported physical activity questionnaire could have informed their awareness regarding their physical activity level as they will have listed their activities and be more conscious of their behaviour than they would be generally. This should be listed as a limitation. You don’t seem to use the self-report data so why was it collected? If it was not used do not report it.

We agree that the completion of a self-reported physical activity questionnaire likely would have influenced our assessment of awareness of physical activity by increasing conscientiousness of physical activity behaviour beyond what is normal. Therefore, we had participants complete the FAB baseline questionnaire, which included our measure of self-rated physical activity, prior to the start of their Fenland Study health assessment and the completion of a self-reported physical activity question. We have clarified this on page 4, lines 184 to 185, which read, "Prior to the start of their Fenland Study health assessment, FAB study participants completed a baseline questionnaire, which included a measure of self-rated physical activity (explained in detail below)."

We did utilise our measure of self-reported physical activity in the study. Self-reported physical activity was examined as a potential correlate of awareness of physical activity and was included in our analyses (it is shown in each table). We have now highlighted this point on page 6, lines 343 to 345, which read, “Compared to those who correctly perceived themselves to be inactive, overestimators had a lower BMI and engaged in more physical activity according to both self-reported and objective measures, although not enough to be classified as active.”

5) Pg 3-4 Line 158 onwards: Section needs re-writing as it does not read well and is confusing in its current state. On line 159 the question for the concern construct is needed as the response options make no sense in the context of the sentence. This
whole section will read much better if each construct is described in the same manner and the same information given for all. For all constructs; list the construct e.g. concern, give an example item (add this), state the number of response items e.g. 4-point scale and give the response scale e.g. not at all to very.

We have substantially amended this section and feel that our changes have greatly reduced the possibility for confusion. Page 4, lines 184 to 205 now read as follows:

"Prior to the start of their Fenland Study health assessment, FAB study participants completed a baseline questionnaire, which included a measure of self-rated physical activity (explained in detail below). The measures were taken from the previously validated ProActive study questionnaires, which were largely based on the Theory of Planned Behavior and were amended where appropriate [19, 32, 33]. Time orientation (defined as the tendency to be motivated by either future or present goals in making decisions) was measured using a nine-item form of the validated Zimbardo Time Perspective Inventory [34]. Concern about physical activity was measured by asking participants, "How concerned are you about your level of physical activity?" Participants rated their concern on a 4-point scale, ranging from "not at all" to "very". Worry about physical activity was measured by asking participants, "How often have you thought about your level of physical activity?" and "How often have thoughts about your physical activity level affected your mood?" Participants answered on a 4-point scale, ranging from "not at all" to "almost all of the time" [32, 33].

Each of the following items included a statement that was evaluated on a 5-point response scale, ranging from "strongly disagree" to "strongly agree" [19, 32, 33]. Self-efficacy (e.g., "I am confident that I could be more physically active in the next two months, if I wanted to") and response efficacy (e.g., "If I was more physically active in the next two months, it is likely that my health would improve") were measured with two and four Likert items, respectively. Perceived importance (i.e., "Physical activity is important for maintaining good health"), subjective norm (i.e., "Most people who are important to me would want me to be more physically active"), perceived adequacy (i.e., I do enough physical activity to stay healthy), and intention to be more physically active (i.e., "I intend to be more physically active in the next two months") each were measured using one Likert item."

6) Pg 4 Line 178-179: “equivalent to 30 minutes of moderate to vigorous physical activity per day.” You state that individuals were classed as meeting guidelines if they had a PAL which is equivalent to 30 mins/day. Physical activity guidelines were 30 mins on 5 days per week so in actual fact your participants had to achieve more than guidelines in order to be labelled as meeting guidelines. If this is the case then it is a massive limitation as your paper can’t claim to more accurately match awareness of physical activity and actual physical activity as the items are not equivalent (i.e. your objective assessment of meeting guidelines is based on 30 mins/day whereas the awareness measure is based on 30 mins 5 times per week).

We agree and the sentence now reads, “An habitual PAL > 1.7 is associated with reduced risk of overweight, obesity, type 2 diabetes, and cardiovascular disease, and is approximately equivalent to 30 minutes of moderate to vigorous physical activity per day at least 5 days of the week [3].” The omission of “at least 5 days of the week“ was a mistake.

7) Pg 5 Line 269: Within the ‘inactive bunch’ overestimation appears to be a good thing… In addition, the finding that overestimators are more active could explain the lower intention. Was current physical activity level controlled for in the analyses? Pg 6 Line 288: Again, could this not just be because they were more active and so had less need to increase physical activity?

We feel that overestimation should be viewed negatively, because although overestimators do more activity than realistic inactives, their activity is still insufficient for maintaining health. The fact that they are on average overweight (although admittedly not as
overweight as realistic inactives) and have reduced intention to increase their physical activity should be cause for concern. We have addressed this issue in our response to comment number 9 above. More specifically page 6, lines 358 to 371, now read as follows:

"It is important to highlight that although overestimators appear to be healthier than those who are realistic about their inactivity, on average they were overweight and their physical activity level was inadequate. This places them at increased health risk, which may be worsened by their inaccurate belief that they do enough physical activity to stay healthy. Overestimators are also less inclined to believe that physical activity has beneficial effects, and they express less intention to increase their physical activity than those who are realistic about their inactivity...within the framework of health behaviour theory, each of these findings suggest that overestimators are less likely to increase their physical activity than realistic inactives..."

8) Pg 6 Line 306-307: As you state in your introduction misperceptions can be because people do not judge their own activity well or because they do not know how much they should do. I do not think this reference to pedometers adds to this paper as pedometers themselves are unlikely to improve awareness unless individuals know how many steps they should be doing. In addition this paper is concerned with the guideline of mins/day not necessarily steps. Find a better example of a strategy that could be used to apply your findings in place of this pedometer reference.

We feel that the example of pedometers is both appropriate and compelling. The article we cited explains that pedometers typically provide the wearer with feedback on the number of steps that they take, and the 10,000 step goal that is usually used as a target for wearers results in a level of physical activity that has been shown to be equivalent to meeting the current physical activity guidelines. Thus, individuals who wear a pedometer know the number of steps they take and what is required to be considered active, both of which which will likely result in an increase in their awareness of physical activity. As we state, behavioural health theory suggests that this may stimulate intention to increase physical activity, which ultimately may lead to positive changes in behaviour. We have added another reference that discusses this mechanism in the case of pedometers. However, if the Academic Editor decides that removing these citations is necessary for publication of our manuscript, then we will defer to her decision.