

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	The association between objectively measured sitting and standing with body composition: A pilot study using magnetic resonance imaging
AUTHORS	Smith, Lee; Thomas, Louise; Bell, Jimmy; Hamer, Mark

VERSION 1 - REVIEW

REVIEWER	Jerome Fryer Private Practice CANADA
REVIEW RETURNED	06-May-2014

GENERAL COMMENTS	<p>Well written. This is a topic that deserves more attention so I applaud the author's effort.</p> <p>The authors report they have objectively measured using a postural allocation technique. It would be helpful if the authors would define this technique to the reader in the discussion first sentence as defined by : an accelerometer/ inclinometer device strapped to the inner thigh. It would also be helpful to explain how the mechanism works to help in arriving in an objective measure. To claim that it objectively measures differences in sitting and standing is a little misleading. I would explain the way it measures these changes. It is difficult to see the science of the device and how those measures are recorded. An explanation I think would help. The reference 14 leads to a validation article "validation of wearable monitors for assessing sedentary behavior" which validates a sedentary behaviour. If the word "validation" is to be used, a proper referencing article should be referenced instead of 14 which is an observational study.</p> <p>Also, the link to the product needs to be updated as there is a redirect to a home page.</p> <p>If it is suggested that in the conclusions that the objectively measured is explained by way of _____ in this study. As stated above, how the objectivity is arrived at (accelerometer/inclinometer strapped to the inner thigh). There are many ways to objectively measure sitting and standing.</p> <p>A good pilot study.</p>
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REVIEWER	Sarah Kozey Keadle National Cancer Institute, United States
REVIEW RETURNED	08-May-2014

<p>GENERAL COMMENTS</p>	<p>Major comments:</p> <p>The authors investigate the association between levels of sitting time, standing time and steps/day and body composition. Strengths of the study include strong measures of posture and body composition. The paper is well written. Limitations include the very small sample size and limited statistical analysis, and interpretation.</p> <p>The authors focus on replacing sitting with standing (rather than light-intensity activity more broadly). I was wondering whether they could explain the rationale for that distinction?</p> <p>I am concerned with the interpretation/conclusions, particularly in the discussion lines 276-283, where the authors conclude the associations were “far weaker” for steps compared to sitting. However, in table 2 the correlation coefficients for steps are more than double that of sitting for BMI and total adiposity and, given the likely imprecision due to the small sample size, the effects for visceral fat/abdominal fat ration are similar (and “more” significant for steps). It would be informative to have scatter plots to illustrate the associations for all the variables to provide the reader more information to interpret these results.</p> <p>There are also concerns regarding the sample included. Do you know how many of them engaged in exercise? Was this screened at baseline? Could you estimate MVPA from the MET-hr column in the activPAL? While I appreciate that there are limited things one can control for in a small sample, there are robust associations with exercise and visceral fat. At least one participant averaged 20,000 steps, which suggests high levels of exercise. The range for steps (2,000-19000) was much higher than the range for sitting (11-15hrs), thus some effort to stratify or control for MVPA seems important.</p> <p>Comments about power analysis:</p> <ol style="list-style-type: none"> 1. In the larger study, is that estimate of 20 meaning 20per group or 20 total? 2. Will enrolled participants be engaging in (variable levels of) MVPA at baseline? <p>Minor comments</p> <p>Abstract: Participant section, the word “sort” seems out of place here.</p> <p>Introduction</p> <p>First paragraph: here the authors use “sedentary activities” and “sedentary behaviors” and “sedentary lifestyle”, which is a lot of terms to introduce with subtle (if at all) differences. Suggest replacing sedentary activities with behaviors.</p> <p>Lines 97-104: I think this paragraph is unfairly negative regarding the efficacy of intervention programs to improve physical activity. While I fully agree with the statement that it has been challenging, and there are some programs that have not worked, there are a number of successful interventions that have improved both individual-level and community health (e.g., see http://www.thecommunityguide.org/pa/index.html or Heath et al., Lancet 2012).</p>
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	<p>I also am not convinced by the rationale that if we move people from sitting to standing more it will subsequently be easier to move them from standing to MVPA. The limited research in this area suggests there may be different determinants for these behaviors (sitting/light activity vs MVPA). Are the authors aware of studies that have shown this incremental approach is beneficial, if so they should be cited. Alternatively, the authors could revise this paragraph to state there may be benefits to reducing sitting/increasing standing that may be particularly important given the low levels of people meeting MVPA guidelines.</p> <p>Results:</p> <p>what was the value for the median that defined "high" and "low"? Were any differences between groups significant?</p> <p>Lines 131: can you provide references?</p>
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VERSION 1 – AUTHOR RESPONSE

Reviewer one

The authors report they have objectively measured using a postural allocation technique. It would be helpful if the authors would define this technique to the reader in the discussion first sentence as defined by : an accelerometer/ inclinometer device strapped to the inner thigh.

We have now incorporated the following into the first sentence in the discussion: “The aim of the present study was to investigate the association between objectively measured sitting and standing, using a postural allocation technique (an accelerometer/ inclinometer attached to the participant’s thigh mid-way between the hip and the knee),” Page 10, lines 248 - 249

It would also be helpful to explain how the mechanism works to help in arriving in an objective measure. To claim that it objectively measures differences in sitting and standing is a little misleading. I would explain the way it measures these changes. It is difficult to see the science of the device and how those measures are recorded. An explanation I think would help.

We have incorporated the following under the sub-heading Free Living Activity: “The ActivPal classifies an individual’s free living activity into periods spent sitting, standing and walking, which it has been validated for [14]. The ActivPals inclinometer and unique positioning on the thigh allows the device to distinguish between sitting and standing using proprietary algorithms, which previous objective physical activity monitors have been unable to do.” Pages 6 – 7, lines 179 - 182

The reference 14 leads to a validation article "validation of wearable monitors for assessing sedentary behavior" which validates a sedentary behaviour. If the word "validation" is to be used, a proper referencing article should be referenced instead of 14 which is an observational study.

We thank the reviewer for this observation and an appropriate reference has now been given.

Also, the link to the product needs to be updated as there is a redirect to a home page.

The link to the homepage has now been updated.

If it is suggested that in the conclusions that the objectively measured is explained by way of _____ in this study. As stated above, how the objectivity is arrived at

(accelerometer/inclinometer strapped to the inner thigh). There are many ways to objectively measure sitting and standing.

We have incorporated the following into the conclusion: "This pilot study has provided preliminary evidence of the strong relationships between objectively measured sitting and standing (an accelerometer/ inclinometer attached to the participant's thigh mid-way between the hip and the knee) and precise measures of body composition." Page 12, lines 304 - 305

Reviewer two

The authors focus on replacing sitting with standing (rather than light-intensity activity more broadly). I was wondering whether they could explain the rationale for that distinction?

The aim of this pilot study was to provide pilot data to inform a large scale intervention that will incorporate standing desks into the workplace in an attempt to increase standing time in the overweight and those who do not meet PA guidelines, which we hypothesis will have a beneficial impact on participants' subcutaneous/ visceral, total, and liver adiposity. Therefore, the primary outcome of this pilot study is standing and light-intensity activity is somewhat beyond the scope of the present project.

I am concerned with the interpretation/conclusions, particularly in the discussion lines 276-283, where the authors conclude the associations were "far weaker" for steps compared to sitting. However, in table 2 the correlation coefficients for steps are more than double that of sitting for BMI and total adiposity and, given the likely imprecision due to the small sample size, the effects for visceral fat/abdominal fat ration are similar (and "more" significant for steps). It would be informative to have scatter plots to illustrate the associations for all the variables to provide the reader more information to interpret these results.

We have removed the sentence referring to 'far weaker' associations. We now provide a set of scatter plots that we would propose to include as supplementary material and have referred to them in text.

There are also concerns regarding the sample included. Do you know how many of them engaged in exercise? Was this screened at baseline? Could you estimate MVPA from the MET-hr column in the activPAL? While I appreciate that there are limited things one can control for in a small sample, there are robust associations with exercise and visceral fat. At least one participant averaged 20,000 steps, which suggests high levels of exercise. The range for steps (2,000-19000) was much higher than the range for sitting (11-15hrs), thus some effort to stratify or control for MVPA seems important.

It was not feasible to make multiple statistical adjustments in our analyses owing to the small sample size, and we agree that associations between sitting and adiposity may have been confounded by vigorous exercise. Two participants in our sample recorded more than 15,000 steps. Thus in sensitivity analyses we have removed these participants, although associations between sitting and adiposity remained largely unchanged; average daily sitting was associated with liver adiposity ($r=0.65$, $p=0.043$) and visceral/ subcutaneous abdominal fat ratio ($r=0.73$, $p=0.017$). This analysis has now been reported in the revised paper. Page 8, lines 225- 230

Comments about power analysis:

1. In the larger study, is that estimate of 20 meaning 20per group or 20 total?

We now clarified that it is 20 per group

2. Will enrolled participants be engaging in (variable levels of) MVPA at baseline?

We intend to exclude people that meet the current guideline (150 min/wk MVPA)

Abstract: Participant section, the word "sort" seems out of place here.

Sort has been replaced with "recruited".

First paragraph: here the authors use "sedentary activities" and "sedentary behaviors" and "sedentary lifestyle", which is a lot of terms to introduce with subtle (if at all) differences. Suggest replacing sedentary activities with behaviors.

Sedentary activities has been replaced with sedentary behaviours throughout the paper.

Lines 97-104: I think this paragraph is unfairly negative regarding the efficacy of intervention programs to improve physical activity. While I fully agree with the statement that it has been challenging, and there are some programs that have not worked, there are a number of successful interventions that have improved both individual-level and community health (e.g., see <http://www.thecommunityguide.org/pa/index.html> or Heath et al., Lancet 2012).

We agree, and thank the reviewer for this comment . We have now amended the first sentence of the paragraph so it now reads: "Such a strategy might not necessarily involve exercise of moderate or vigorous intensity, as interventions to increase exercise levels have proved challenging."

I also am not convinced by the rationale that if we move people from sitting to standing more it will subsequently be easier to move them from standing to MVPA. The limited research in this area suggests there may be different determinants for these behaviors (sitting/light activity vs MVPA). Are the authors aware of studies that have shown this incremental approach is beneficial, if so they should be cited. Alternatively, the authors could revise this paragraph to state there may be benefits to reducing sitting/increasing standing that may be particularly important given the low levels of people meeting MVPA guidelines

Thank you. We have amended the text as follows: "If lifestyle population activity patterns can be shifted from predominantly sedentary to the next lowest physical activity (PA) category (standing), this may have public health benefit given the low proportion of individuals meeting current PA guidelines."
Page 4, lines 101 - 104

what was the value for the median that defined "high" and "low"? Were any differences between groups significant?

The high/low cut point for the ratio of standing: sitting was ≥ 0.27 (now clarified) in figure. We did not test for statistical differences as the figures were provided for illustrative purposes. The median split is an artificial grouping thus the linear analyses has the greatest power to detect statistical differences.

Lines 131: can you provide references?

The below reference has now been provided.

Pou KM, Massaro JM, Hoffmann U, Vasan RS, Maurovich-Horvat P, Larson MG, Keaney JF Jr, Meigs JB, Lipinska I, Kathiresan S, Murabito JM, O'Donnell CJ, Benjamin EJ, Fox CS. Visceral and subcutaneous adipose tissue volumes are cross-sectionally related to markers of inflammation and oxidative stress: the Framingham Heart Study. *Circulation*. 2007;116(11):1234-41.

VERSION 2 – REVIEW

REVIEWER	Sarah Keadle National Cancer Institute, USA
REVIEW RETURNED	19-May-2014

GENERAL COMMENTS	<p>The paper has been improved and the authors were responsive to the reviewer's comments.</p> <p>In response to the previous review, reviewer 1, #2a you stated that you removed the analysis for second-by-second comparisons, (lines 238-240), but in the methods I believe it still describes that analysis? (lines 194-197).</p> <p>Minor comments: please add the actual numbers for mean difference and levels of agreement for bland-altman plots (in text, legend or actual figure).</p> <p>Page 7, line 117: Suggest revising to read ... in the laboratory measurement. In the free-living measurement, the AP was waterproofed and attached with a Tegaderm and participants were instructed not to remove it for sleeping or showering."</p> <p>Page 8, line 153, should this be AG and AP?</p>
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VERSION 2 – AUTHOR RESPONSE

In response to the previous review, reviewer 1, #2a you stated that you removed the analysis for second-by-second comparisons, (lines 238-240), but in the methods I believe it still describes that analysis? (lines 194-197).

We are unclear exactly what the reviewer refers to when they say 'second-by-second analysis'. This does not describe the mentioned analysis.

Minor comments: please add the actual numbers for mean difference and levels of agreement for bland-altman plots (in text, legend or actual figure).

The mean differences are presented in the main figure (Figure 1). Presenting these data in the text would duplicate the information already provided in the figure (Figure 1). We would prefer to retain the figure as it is more illustrative of the results. We believe that we have already presented levels of agreement for bland-altman plots in the form of correlations (see Table 2).

Page 7, line 117: Suggest revising to read ... in the laboratory measurement. In the free-living measurement, the AP was waterproofed and attached with a Tegaderm and participants were instructed not to remove it for sleeping or showering."

Thank you. We have revised text accordingly.

Page 8, line 153, should this be AG and AP?

It is not clear what the reviewer is referring to here as line 153 refers to a description of the sample.