

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Objectively-assessed and self-reported sedentary time in relation to multiple socioeconomic status indicators among adults in England: a cross-sectional study
AUTHORS	Stamatakis, Emmanuel; Coombs, Ngaire; Rowlands, Alex; Shelton, Nicola; Hillsdon, Melvyn

VERSION 1 - REVIEW

REVIEWER	Clemens Drenowatz University of South Carolina Department of Exercise Science
REVIEW RETURNED	04-Aug-2014

GENERAL COMMENTS	<p>Methods (including non-abridged methods) Please list the total number as well as men and women of participants in HSE that were initially included in the analysis. It may also be helpful to specify the age range rather than 16 years of age and older.</p> <p>Weight measurements should be specified within the manuscript, specifically regarding clothing and fasted state. It would also be helpful to specify how many measurements were taken for each participant.</p> <p>Please specify whether questions on social class and education asked participants to classify themselves in one of the categories mentioned or whether they reported their actual profession and highest educational level and were subsequently classified by the authors.</p> <p>Please specify whether participants were instructed to wear the armband for 24 hours or only during waking hours. What was the time period accelerometers were given to the participants? How were accelerometers distributed and collected? Was accelerometer data stratified by weekend and weekday and dealt with similarly than questionnaire data for total sedentary time (i.e. 5 days for weekdays and 2 days for weekend).</p> <p>Did the time period for questions on sedentary behavior include the time accelerometers were worn? The different time span for collecting objective data and subjective reports could affect the outcome of the study.</p> <p>Please specify the cutpoints for the 5 SEP categories in the main manuscript.</p> <p>There is some concern about using a single day for accelerometer wear time as a representative value for a total week, particularly when the analysis also looked at weekdays and weekend separately (appendix).</p> <p>Occupational sitting time should be adjusted for total occupation time as was done on accelerometer data for total wear time. Further,</p>
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weekdays and weekend days should be treated separately as was done for reported sedentary behaviors. This could have a profound effect on the reported results.

The manuscript describes differences in sedentary behaviors across SEP assessed by different indicators. While this is an interesting and important questions, several limitations should be addressed and more details on the methodology are needed (see below for specifics).

Abstract:

Please specify the age range of your participants.

Introduction

p.4, lines 11-12: Please list references 2-5 at the end of the sentence

Methods (including non-abridged methods)

Please list the total number as well as men and women of participants in HSE that were initially included in the analysis. Please specify the age range rather than 16 years of age and older. Weight measurements should be specified within the manuscript, specifically regarding clothing and fasted state. It would also be helpful to specify how many measurements were taken for each participant.

In addition, please specify whether questions on social class and education asked participants to classify themselves in one of the categories mentioned or whether they reported their actual profession and highest educational level and were subsequently classified by the authors.

Please specify whether participants were instructed to wear the armband for 24 hours or only during waking hours. What was the time period accelerometers were given to the participants? How were accelerometers distributed and collected? Was accelerometer data stratified by weekend and weekday and dealt with similarly than questionnaire data on sedentary behavior (i.e. 5 days for weekdays and 2 days for weekend).

Did the time period for questions on sedentary behavior include the time accelerometers were worn? The different time span for collecting objective data and subjective reports could affect the outcome of the study.

Please specify the cutpoints for the 5 SEP categories in the main manuscript.

Statistical Analysis:

There is some concern about using a single day for accelerometer wear time as a representative value for a total week, particularly when the analysis also looked at weekdays and weekend separately (appendix).

Occupational sitting time should be adjusted for total occupation time as was done on accelerometer data for total wear time. This could have a profound effect on the reported results.

Results:

What was the average wear time for accelerometer and how many valid days were available including weekdays and weekend days? Please report statistics for GLM with p-value in addition to p for trend reported in figures. It may also be helpful to show which groups differ significantly.

A more selective use of figures may be necessary in the main

	<p>manuscript to reflect the results of key interest. Additional figures can be proved in supplementary files.</p> <p>Discussion: It would be helpful to elaborate on the health implications of different sedentary behaviors. In the introduction the authors rightfully pointed out that low SEP is associated with poorer health outcomes, which may be connected with ST – results of the present study, however, point in the opposite direction. This should be commented on in more detail prior to the conclusion.</p>
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REVIEWER	Jason Gill University of Glasgow, United Kingdom
REVIEW RETURNED	21-Aug-2014

GENERAL COMMENTS	<p>This is a clear and well-written paper describing the relationship between socio-economic status and sedentary time using data from the 2008 Health Survey for England. I have the following comments for the authors to address when revising this paper.</p> <p>1) Abstract. lines 16-18. Please mention that television time, non-television leisure-time sitting and occupational sitting/standing were self-report measures.</p> <p>2) Abstract. lines 46-50. The conclusion that TV viewing may contribute to socioeconomic inequalities in health goes beyond what the data show. The study shows that TV viewing is related to socioeconomic position and does not show a relationship between this and health outcomes. Please remove this sentence.</p> <p>3) The paper uses both accelerometer and self-report data and combines both measures in the conclusion that total sedentary time (measured by accelerometer) and occupational sitting/standing time (measured by self-report) increase with increasing SEP, with TV viewing (measured by self-report) showing the opposite relationship. However, from Table 1, summing the three self-report measures of sedentary time (TV, non-TV sitting, occupational sitting/standing), shows greater sedentary time in the low SEP group, i.e. the opposite relationship to accelerometer-derived sedentary time. This suggests that there may be biases in the self-report data that could confound the results and using both self-report data and accelerometer data to draw conclusions may have some limitations. This should be discussed and included in the limitations in the article summary. Is there any potential of biases in the reporting of self-reported sedentary behavior across SEP?</p> <p>4) It is possible that the greater occupational sitting/standing in the higher SEP groups may simply reflect working longer hours. Can the authors comment on whether this may be the case in the discussion? Were there differences in occupational physical activity across the SEP (which would be expected if similar total hours were worked between groups)?</p> <p>5) The inclusion of standing in the measure of occupational sedentary time is an important limitation and should be discussed in more detail in the discussion and mentioned as a limitation in the article summary.</p>
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VERSION 1 – AUTHOR RESPONSE

REVIEWER: 1

The manuscript describes differences in sedentary behaviors across SEP assessed by different indicators. While this is an interesting and important questions, several limitations should be addressed and more details on the methodology are needed (see below for specifics).

COMMENT 1.1:

Abstract:

Please specify the age range of your participants.

OUR RESPONSE:

The age range was 16-96 years. We have added this in the abstract as requested.

COMMENT 1.2:

Introduction

p.4, lines 11-12: Please list references 2-5 at the end of the sentence

OUR RESPONSE:

References 2-5 had all-cause mortality outcomes but only references 2 and 3 had cardiovascular mortality outcomes. Listing all references 2-5 at the end will be inaccurate as it will suggest that all studies had both all-cause and cardiovascular mortality as outcomes.

COMMENT 1.3:

Methods (including non-abridged methods)

Please list the total number as well as men and women of participants in HSE that were initially included in the analysis.

OUR RESPONSE:

We added the numbers that the HSE 2008 response rates were based on. We report the total numbers of participants included in the analyses in the first paragraph of the results section and have added the number of males for each analysis (and in the first paragraph of the unabridged methods Supplementary file). Each outcome/analysis has a different sample size (that is clearly indicated in each corresponding Figure).

COMMENT 1.4:

Please specify the age range rather than 16 years of age and older.

OUR RESPONSE:

We added the age range in the “Study Sample” section of the methodology.

COMMENT 1.5:

Weight measurements should be specified within the manuscript, specifically regarding clothing and fasted state. It would also be helpful to specify how many measurements were taken for each participant.

OUR RESPONSE:

We added some more detail on the weight and height measurements as suggested by the reviewer (please see “Demographics and contextual variables” section).

COMMENT 1.6:

In addition, please specify whether questions on social class and education asked participants to classify themselves in one of the categories mentioned or whether they reported their actual profession and highest educational level and were subsequently classified by the authors.

OUR RESPONSE:

We added some more detail on how the socioeconomic classification was done in the beginning of the “Socioeconomic position measures” section.

COMMENT 1.7:

Please specify whether participants were instructed to wear the armband for 24 hours or only during waking hours. What was the time period accelerometers were given to the participants? How were accelerometers distributed and collected? Was accelerometer data stratified by weekend and weekday and dealt with similarly than questionnaire data on sedentary behavior (i.e. 5 days for weekdays and 2 days for weekend).

OUR RESPONSE:

Respondents wore an Actigraph, not an Armband. The Actigraph was worn only during waking times and this is already explained in the methods section (see first few lines of “Sedentary time and physical activity measure” section). Actigraph data were day-specific but we did not take time of the week into account in the accelerometry analyses because our minimum inclusion criterion for accelerometry was at least one day of valid wear.

Of note, in the same section of the revised manuscript we cited a recent study that examined the validity of the physical activity questions.

COMMENT 1.8:

Did the time period for questions on sedentary behavior include the time accelerometers were worn? The different time span for collecting objective data and subjective reports could affect the outcome of the study.

OUR RESPONSE:

Both the accelerometric measurements and the questionnaire were meant to capture “usual” SB, although the self-reported sedentary time questions referred to the last 4 weeks prior to the interview date while the accelerometers were usually worn the week after the interview. Given that adults’ patterns of sedentary behaviour and physical activity are relatively stable over the same season we do not expect that the slightly different timing of the two types of measurements adds considerable bias in our results.

We have added some clarification on the time frame of the self-reported sedentary time questions in the second paragraph of the “Sedentary time and physical activity measures” section of the revised manuscript.

COMMENT 1.9:

Please specify the cutpoints for the 5 SEP categories in the main manuscript.

OUR RESPONSE:

We added an explanation of the SEP groupings in the main text (see “Regrouping the Socioeconomic position variables” paragraph). SEP1 consisted of the lowest two SEP categories (0 and 1), SEP2 comprised categories 2 and 3, SEP3 comprised categories 4 and 5, SEP4 comprised categories 6 and 7, and SEP5 comprised of categories 8 and 9 (the highest observed SEP category).

COMMENT 1.10:

Statistical Analysis:

There is some concern about using a single day for accelerometer wear time as a representative value for a total week, particularly when the analysis also looked at weekdays and weekend separately (appendix).

OUR RESPONSE:

Our minimum accelerometry inclusion criterion of 1 day of valid data was in line with other major accelerometry studies (e.g. Ekelund U, et al. Moderate to Vigorous Physical Activity and Sedentary Time and Cardiometabolic Risk Factors in Children and Adolescents. *JAMA* 2012;307:704-12; & Matthews CE C, et al. Amount of time spent in sedentary behaviors in the united states, 2003-2004. *American Journal of Epidemiology* 2008;167:875-81.). Besides, in our sample only 2.1% had just 1 valid day and 95.5% had at least 3 or more valid days. As such, it is extremely unlikely that our results are biased by the accelerometry valid days inclusion criterion.

COMMENT 1.1:

Occupational sitting time should be adjusted for total occupation time as was done on accelerometer data for total wear time. Further, weekdays and weekend days should be treated separately as was done for reported sedentary behaviors. This could have a profound effect on the reported results.

OUR RESPONSE:

Our analyses of occupational sitting/standing were limited to those who reported being in employment only. Unfortunately, we do not have information on total occupation time and therefore we cannot follow this useful suggestion. Similarly, we have no information on weekday Vs weekend occupational sitting and we cannot follow this suggestion either.

COMMENT 1.11:

Results:

What was the average weartime for accelerometer and how many valid days were available including weekdays and weekend days?

OUR RESPONSE:

The mean wear time on valid days was 830.8 minutes. The mean number of valid days (for those with at least 1 valid day) was 6.0. We included this information in the revised manuscript (last paragraph of page 11 under "Descriptives").

COMMENT 1.12:

Please report statistics for GLM with p-value in addition to p for trend reported in figures. It may also be helpful to show which groups differ significantly.

OUR RESPONSE:

We would like not to follow this suggestion for the following reasons:

- The aim of our manuscript was to examine associations between SEP and sedentary behaviour variables and we feel that adding p values for comparing specific groups will not add any useful information and will clutter a very data-dense manuscript.
- While there is practically no benefit in reporting the GLM values, it is not practical to report more p values in an extremely data-dense manuscript and the very busy Figures. For example, if we were to report the GLM p values for comparing each SEP group from the referent group we would have to add some 48 p values per Figure (4 p values X 3 models X 4 outcomes presented in each figure).
- There is a practical issue with extracting GLM p values from imputed analyses our statistical package (SPSS) gives GLM p values for each of the 20 imputed models only, but not for the pooled model we report result from.

COMMENT 1.13:

A more selective use of figures may be necessary in the main manuscript to reflect the results of key interest. Additional figures can be proved in supplementary files.

OUR RESPONSE:

We report a comprehensive set of graphical results and we feel that each one of the Figures will be of interest to the Journal's readers. Since BMJ Open is an online-only journal and print costs are not an issue, we would prefer to leave all Figures in as in the original version of the manuscript.

COMMENT 1.14:

Discussion:

It would be helpful to elaborate on the health implications of different sedentary behaviors. In the introduction the authors rightfully pointed out that low SEP is associated with poorer health outcomes, which may be connected with ST – results of the present study, however, point in the opposite direction. This should be commented on in more detail prior to the conclusion.

OUR RESPONSE:

This comment supplements comment 2.2 below where the 2nd reviewer is asking us to remove the sentence about contribution of sedentary behaviour to socioeconomic inequalities from the conclusion. We addressed both comments by moving this sentence from the conclusion to the end of the paragraph where we discuss the associations between accelerometry-measured sedentary time and SEP (page 16 of revised manuscript).

REVIEWER: 2

This is a clear and well-written paper describing the relationship between socio-economic status and sedentary time using data from the 2008 Health Survey for England. I have the following comments for the authors to address when revising this paper.

COMMENT 2.1:

1) Abstract. lines 16-18. Please mention that television time, non-television leisure-time sitting and occupational sitting/standing were self-report measures.

OUR RESPONSE:

Done.

COMMENT 2.2:

2) Abstract. lines 46-50. The conclusion that TV viewing may contribute to socioeconomic inequalities in health goes beyond what the data show. The study shows that TV viewing is related to socioeconomic position and does not show a relationship between this and health outcomes. Please remove this sentence.

OUR RESPONSE:

We agree with the reviewer that this sentence is misplaced at the conclusion. Please see our response to comment 1.14 below.

COMMENT 2.3:

3) The paper uses both accelerometer and self-report data and combines both measures in the conclusion that total sedentary time (measured by accelerometer) and occupational sitting/standing time (measured by self-report) increase with increasing SEP, with TV viewing (measured by self-report) showing the opposite relationship. However, from Table 1, summing the three self-report measures of sedentary time (TV, non-TV sitting, occupational sitting/standing), shows greater sedentary time in the low SEP group, i.e. the opposite relationship to accelerometer-derived

sedentary time. This suggests that there may be biases in the self-report data that could confound the results and using both self-report data and accelerometer data to draw conclusions may have some limitations. This should be discussed and included in the limitations in the article summary. Is there any potential of biases in the reporting of self-reported sedentary behavior across SEP?

OUR RESPONSE:

Our study does not provide any direct evidence for differential measurement error (by SEP) of self-reported sedentary time. The most obvious explanation of the different direction of the SEP-ST association between the two types of ST measurements (objective Vs self-reported) is that the three self-reported measures are not meant to capture “total” ST. For example, highly prevalent activities like driving a car or sitting in public transport are not captured. In other words, the contrasting association is not due to differential measurement error/boas but due to the nature and coverage of the two types of measurements.

COMMENT 2.4:

4) It is possible that the greater occupational sitting/standing in the higher SEP groups may simply reflect working longer hours. Can the authors comment on whether this may be the case in the discussion? Were there differences in occupational physical activity across the SEP (which would be expected if similar total hours were worked between groups)?

OUR RESPONSE:

Unfortunately, we do not have information on total occupation time and therefore we cannot follow this useful suggestion. Also, please see our response to Comment 1.1 above.

COMMENT 2.5:

5) The inclusion of standing in the measure of occupational sedentary time is an important limitation and should be discussed in more detail in the discussion and mentioned as a limitation in the article summary.

OUR RESPONSE:

We flagged this as a limitation and we linked to a similar weakness of the accelerometric measurements (i.e. that accelerometers cannot differentiate between sitting and standing). Please see middle of page 17 in the revised version of the manuscript. We also added this as a limitation in the article summary.

VERSION 2 – REVIEW

REVIEWER	Clemens Drenowatz University of South Carolina USA
REVIEW RETURNED	30-Sep-2014

GENERAL COMMENTS	<p>The lack of information on total occupational time needs to be acknowledged in the limitation section as participants with less occupational time will have less ST in occupation.</p> <p>The inclusion of single accelerometer days in the analysis remains of concern even though the authors report that most participants had more than 3 days of wear time.</p> <p>The authors have addressed most of the previously mentioned concerns but some minor comments may be addressed prior to publication:</p> <p>Of particular concern is the lack of information on total occupation time as this seems to be the driving component on total ST - the authors should address this in the limitations section.</p>
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	<p>It would also be helpful to specify whether accelerometry data was treated similar to self-report data - i.e. adjust by the number of available weekdays and weekend days; (avg. weekday*5 + avg. weekend*2)/7</p> <p>minor comments: Abstract: line 22: ..., and area deprivation for each SEP ... Bullet 3 on strengths and limitations: area</p> <p>Methods: line 16: ...to group them ... line 18: "III" is listed twice for manual and non-manual - please clarify</p> <p>unabridged methods: Please adjust the number of participants providing self-reported TV time (as was done in the main manuscript).</p>
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REVIEWER	Jason Gill University of Glasgow, UK
REVIEW RETURNED	20-Sep-2014

GENERAL COMMENTS	<p>The authors have satisfactorily addressed most of my comments in this revised manuscript.</p> <p>In response to comment 2.4: I appreciate that data regarding occupational hours are not available. However, it is possible that relationship between greater occupational sitting/standing in the higher SEP groups may simply reflect working longer hours, and this is worthy of comment in the discussion. The authors should highlight this as a possibility and then comment that the data are not available to determine whether not this was the case.</p>
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VERSION 2 – AUTHOR RESPONSE

REVIEWER: 2

The authors have satisfactorily addressed most of my comments in this revised manuscript.

In response to comment 2.4: I appreciate that data regarding occupational hours are not available. However, it is possible that relationship between greater occupational sitting/standing in the higher SEP groups may simply reflect working longer hours, and this is worthy of comment in the discussion. The authors should highlight this as a possibility and then comment that the data are not available to determine whether not this was the case.

OUR RESPONSE:

We would like to thank the reviewer for this further suggestion how to address this important issue. We have followed this suggestion by adding a sentence in the first paragraph of the discussion:

“As low SEP is more likely to involve fixed length shift-based work one possible explanation is that these occupational ST differences reflect the longer working hours of professionals in higher SEP groups, although we had no information on work times to examine this hypothesis or make statistical

adjustments.”

We also added a sentence in the limitations section:

“The lack of information on work times did not allow us to examine the possibility that ST differences between SEP groups are partly due to longer work hours in higher SEP groups.”

REVIEWER: 1

Comment: The lack of information on total occupational time needs to be acknowledged in the limitation section as participants with less occupational time will have less ST in occupation. The inclusion of single accelerometer days in the analysis remains of concern even though the authors report that most participants had more than 3 days of wear time.

OUR RESPONSE:

We have addressed the lack of information on occupational time, please see our response to the first reviewer's comment.

In our sample only 2.1% had just 1 valid day and 95.5% had at least 3 or more valid days. As such, it is extremely unlikely that our results are biased by the accelerometry valid days inclusion criterion.

To further address the reviewer's comment we repeated the analysis looking at the associations between ST and SEP score using 3 valid days as the minimum wear time criterion. Estimates were virtually unchanged (data not shown).

Comment: The authors have addressed most of the previously mentioned concerns but some minor comments may be addressed prior to publication:

Of particular concern is the lack of information on total occupation time as this seems to be the driving component on total ST - the authors should address this in the limitations section.

OUR RESPONSE:

We have addressed the lack of information on occupational time, please see our response to the first reviewer's comment.

Comment: It would also be helpful to specify whether accelerometry data was treated similar to self-report data - i.e. adjust by the number of available weekdays and weekend days; $(\text{avg. weekday} * 5 + \text{avg. weekend} * 2) / 7$

OUR RESPONSE:

Since our minimum accelerometry wear time criterion was one day (which is in line with other major accelerometry studies, such as Ekelund U, et al. JAMA 2012;307:704-12; & Matthews CE C, et al. American Journal of Epidemiology 2008;167:875-81) we could not apply a time of the week-specific algorithm in the treatment of the accelerometry data. We added an explanation in the “Sedentary time and physical activity measures” paragraph (see page 9 of the revised manuscript):

“...and daily ST time was calculated as the sum of the average ST minutes per valid day divided by the number of valid days”

Comment: minor comments:

Abstract:

line 22: ..., and area deprivation for each SEP ...

Bullet 3 on strengths and limitations: area

OUR RESPONSE:

We corrected both of these errors

Comment: Methods:

line 16: ...to group them ...

line 18: "III" is listed twice for manual and non-manual - please clarify

OUR RESPONSE:

We corrected the line 16 error. The categories of the Registrar General's classification in Britain are I, II, III Non-manual, III manual, IV, V. In other words category 3 is split into manual and a non-manual.

Comment: unabridged methods:

Please adjust the number of participants providing self-reported TV time (as was done in the main manuscript).

OUR RESPONSE:

We corrected this error.