

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (<http://bmjopen.bmj.com/site/about/resources/checklist.pdf>) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Association between perceived weight discrimination and physical activity: a population-based study among English middle-aged and older adults
AUTHORS	Jackson, Sarah; Steptoe, Andrew

VERSION 1 - REVIEW

REVIEWER	Kaley Roosen York University, Canada
REVIEW RETURNED	10-Nov-2016

GENERAL COMMENTS	<p>Really interesting study. It was short and I have suggested a few elaborations throughout that I think will strengthen the paper overall.</p> <p>Comments:</p> <ol style="list-style-type: none">1) I suggest changing the end of the title to “a population based study in older adults” as it is misleading without indicating that it is older adults.2) Please make the same change suggested above in the abstract.3) In abstract, please specify number of women and men rather than a whole combined n value.4) Please rephrase “vicious cycle of weight gain and mistreatment” to sound less colloquial. Perhaps remove the word vicious.5) In Introduction, I would state 7-43% rather than list all 3 instances of reported weight discrimination.6) Rephrase weight-related behaviours to be more specific. Ex. Limited physical activity, etc.7) When listing the study that contradicts findings (higher weight stigma for higher exercise), can you put a brief explanation for this finding? For instance, was this study with gym goers or younger people or athletes?8) For the discriminatory examples, where did these come from? Are they a valid scale? If they were from other research, please source.9) Why was disability not considered as a possible discrimination explanation? I believe you should put this in your limitations section. It is a commonly reported discriminatory reason. Also it would be a possible confound with physical activity/weight discrimination. Persons who experience disability related discrimination may be less likely to participate in physical activity because of physical limitations. And weight discrimination may be related to lack of mobility.10) Please write out what ELSA stands for.11) Could you add in brief discussion why weight discrimination may be more reported with younger participants? This may have implications for generalizing the information.12) Please make sure to at “in an older sample” in your first line of
-------------------------	--

	<p>the discussion.</p> <p>13) “Our results add weight to this body of evidence” – please reword. Something like “Our results are consistent with ...”</p> <p>14) Perhaps you should mention that study that found inconsistent results. If you do not have space in the intro, you can discuss the discrepancy in the discussion. I think it deserves a mention and possible explanation for the discrepancy.</p> <p>15) Can you comment on how the lack of significance for BMI may be particularly important? For instance, to me, this means that if people lose weight, they may still avoid exercise. Perhaps you should also include a mention about how community/social/school-based interventions may be important as decreasing weight bias may contribute to greater health benefits as opposed to encouraging people to lose more weight.</p> <p>16) “Increase desire to avoid...is suggestive of causal relationship” – can you elaborate? Not sure how that computes. Are you saying that self-reports of people who experience weight stigma suggests a cause and effect?</p> <p>17) How might younger generations differ from older?</p> <p>18) Could a Health At Every Size approach be helpful given your findings? Focus on activity rather than weight?</p>
--	---

REVIEWER	<p>Jason D. Seacat, Ph.D. Western New England University United States</p> <p>I am the primary author of one of the empirical studies mentioned to the current authors.</p>
REVIEW RETURNED	14-Nov-2016

GENERAL COMMENTS	<p>It was a pleasure reading your paper and I hope you find my comments to be helpful to you. As you will see, my main concerns come from the strategies used to assess weight discrimination and physical activity. I also have concerns about the very low rate of reported weight discrimination. I would like to hope the world were becoming less discriminatory about weight, but the rate you report seems on the very low end of what is reported in other studies. I wonder if this has any implications for other outcomes like the lack of a significant interaction between BMI and discrimination? Please take a look at my comments and I wish you the best in your program of research.</p> <p>Introduction:</p> <p>The authors do a decent job, given wording constraints, of outlining the some of the basics of the weight discrimination problem and its consequences. I would have liked to have seen inclusion of some of the longitudinal studies (given that this study was based on longitudinal data) that have already been conducted as well. These studies used smaller sample sizes, and were conducted over shorter timeframes, but have conclusions that are relevant to and supportive of the current study.</p> <p>Two studies to also consider:</p> <p>Vartanian and Porter, 2016</p>
-------------------------	---

	<p>Seacat, Dougal and Roy 2014</p> <p>Methods:</p> <p>I certainly appreciate the use of a large, nationally representative sample. I have two significant concerns about these data that would need to be thoroughly addressed by the authors:</p> <p>First, the authors make the claim that their measurement of weight status is more objectively measured and thus more accurate (presumably than existing studies). The problem with their statement is that the authors used wave 4 anthropometric data (2008-2009) to analyze discrimination data from wave 5 (2010-2011). While the gap in time is only one year, the authors need to temper their claim in the abstract about the overall accuracy of their weight measurement. They do acknowledge this limitation at the conclusion of the paper though.</p> <p>The second concern I have is with the actual assessment of weight discrimination. Considerable debate exists in the literature about the use of global measures of weight stigma and discrimination in cross-sectional assessments (e.g., Seacat, Dougal and Roy, 2014). It is possible that weight discrimination may be under-reported by participants as various cognitive factors (memory, recall biases) influence what is ultimately reported. I would like to see this more clearly addressed by the authors.</p> <p>In line with the previous concern is the global assessment of physical activity. At the very least, the authors need to temper their language and account for the possibility of inaccuracies given the nature of their assessment approach.</p> <p>Results:</p> <p>I may have missed this, but was there any consideration for prior physical activity levels among participants as a control in the present analyses? Please make this clear.</p> <p>A reported weight discrimination rate of 4.9% of participants over an entire year seems incredibly low. Studies in the US, UK and Australia have identified rates much higher than this. How do the authors rectify this finding with other studies demonstrating far higher rates of discrimination?</p> <p>The findings of the impact of weight discrimination on reported exercise are very intriguing. I am somewhat surprised by the lack of an interaction effect of BMI and discrimination though since other researchers have found that this relationship exists. Might this be due to the relatively low number of people actually reporting discrimination?</p> <p>Discussion:</p>
--	--

	<p>The discussion is well-written. As I mentioned though, the authors should address my aforementioned concerns about global assessments of weight discrimination (they do so somewhat for PA). The authors also need to address the low level of reported weight discrimination and the implications this might have had on the present findings.</p>
--	--

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

Really interesting study. It was short and I have suggested a few elaborations throughout that I think will strengthen the paper overall.

Comments:

1) I suggest changing the end of the title to “a population based study in older adults” as it is misleading without indicating that it is older adults.

- Response: We have edited the title making clear the age of the sample.

2) Please make the same change suggested above in the abstract.

- Response: Our abstract states that participants were aged 50 or older.

3) In abstract, please specify number of women and men rather than a whole combined n value.

- Response: We have made this change as requested.

4) Please rephrase “vicious cycle of weight gain and mistreatment” to sound less colloquial. Perhaps remove the word vicious.

- Response: We have removed the word vicious from this sentence.

5) In Introduction, I would state 7-43% rather than list all 3 instances of reported weight discrimination.

- Response: We have included all three figures to demonstrate the sharp increase in prevalence of discrimination across different categories of overweight and obesity and feel that changing to 7-43% would result in this no longer being clear, so we have chosen not to make this revision.

6) Rephrase weight-related behaviours to be more specific. Ex. Limited physical activity, etc.

- Response: We have added to this sentence so it now reads “...there is increasing evidence that weight discrimination may adversely affect weight-related behaviours, e.g. increasing intake of high-fat, high-calorie foods,⁵ decreasing dietary quality⁶ and limiting physical activity.^{7–11}” (p3).

7) When listing the study that contradicts findings (higher weight stigma for higher exercise), can you put a brief explanation for this finding? For instance, was this study with gym goers or younger people or athletes?

- Response: We have briefly elaborated on the findings of this study, highlighting a discrepancy in its results: “In an online sample of 177 women, individuals who had experienced weight stigma reported higher levels of physical activity, despite being less likely to report believing that weight was under personal control.” (p3).

8) For the discriminatory examples, where did these come from? Are they a valid scale? If they were from other research, please source.

- Response: We have stated that discrimination items were “based on those developed and used

widely in US longitudinal studies” and provided appropriate references (p4).

9) Why was disability not considered as a possible discrimination explanation? I believe you should put this in your limitations section. It is a commonly reported discriminatory reason. Also it would be a possible confound with physical activity/weight discrimination. Persons who experience disability related discrimination may be less likely to participate in physical activity because of physical limitations. And weight discrimination may be related to lack of mobility.

- Response: Disability was in fact included in the list of potential attributions for experiences of discrimination, but we listed just a few examples rather than the entire list. We apologise for not being clearer. We have edited the text to include all possible reasons for discrimination that could be selected by participants: “Participants reporting discrimination in any situation were asked to indicate the reason(s) they attributed their experience to from a list of options including weight, age, sex, race, physical disability, an aspect of physical appearance, sexual orientation, financial status, or other reason.” (p4).

10) Please write out what ELSA stands for.

- Response: We define ELSA at its first use at the start of the method: “Data were from the English Longitudinal Study of Ageing (ELSA)” (p3).

11) Could you add in brief discussion why weight discrimination may be more reported with younger participants? This may have implications for generalizing the information.

- Response: We have edited our discussion to highlight the fact that weight discrimination is typically more frequently reported by younger adults and commented on how this may affect generalisability of the findings: “Participants were from an older population, in which levels of physical activity are likely to be lower²² and experiences of weight discrimination are typically less common¹ relative to younger populations so findings cannot be assumed to generalise.” (p7).

12) Please make sure to at “in an older sample” in your first line of the discussion.

- Response: We have highlighted the age of the sample in the third line of the discussion: “...demonstrating an association between self-reported experiences of weight discrimination and engagement in physical activity in a sample of middle-aged and older adults” (p5), to ensure it remains clear that this is the first study to examine weight discrimination and physical activity in a large population-based sample, irrespective of age.

13) “Our results add weight to this body of evidence” – please reword. Something like “Our results are consistent with ...”

- Response: We have reworded to “Our results are consistent with these findings...” (p6).

14) Perhaps you should mention that study that found inconsistent results. If you do not have space in the intro, you can discuss the discrepancy in the discussion. I think it deserves a mention and possible explanation for the discrepancy.

- Response: Thank you for this suggestion. We have added a paragraph to our discussion comparing our results to the previous studies that have examined exercise behaviour, with a focus on the study with inconsistent findings: “Previous studies that have examined associations between weight stigma and actual exercise behaviour have produced mixed results.^{5,6,9,10} Our finding linking weight discrimination with reduced physical activity contrasts with one previous study in particular that observed increased levels of physical activity among women who had experienced weight stigma,¹⁰ but is consistent with two other key findings from the same study. First, the results showed that participants with experience of weight stigma were less likely to believe weight was controllable, which might reduce motivation to engage in exercise for weight control purposes. Second, weight bias internalisation (self-directed stigma) was associated with lower levels of physical activity.” (p6).

15) Can you comment on how the lack of significance for BMI may be particularly important? For instance, to me, this means that if people lose weight, they may still avoid exercise. Perhaps you should also include a mention about how community/social/school-based interventions may be important as decreasing weight bias may contribute to greater health benefits as opposed to encouraging people to lose more weight.

- Response: Thank you for this suggestion. We have added a paragraph to our discussion highlighting the non-significant interaction between BMI and weight discrimination on physical activity and discussed the potential benefits of interventions that address weight bias: "The relationship between weight discrimination and physical activity did not differ significantly by BMI, indicating that individuals who experience weight discrimination are likely to be less physically active, regardless of their weight ... It is possible that a person who encounters weight discrimination may lose weight but still avoid exercise. Given the substantial health benefits of being physically active, interventions that aim to reduce weight bias at a population level – for example through schools, local communities, or national campaigns – may have a greater impact on health than those that encourage people to lose weight." (p6).

16) "Increase desire to avoid....is suggestive of causal relationship" – can you elaborate? Not sure how that computes. Are you saying that self-reports of people who experience weight stigma suggests a cause and effect?

- Response: The study we reference here showed that individuals who had experienced weight stigma subsequently reported a greater desire to avoid exercise. We take this to be suggestive of a causal relationship because it indicates that stigmatising experiences may influence a person's desire to be physically active and thereby may have an effect on actual levels of physical activity. We have reworded this sentence in an effort to clarify this point.

17) How might younger generations differ from older?

- Response: We have edited this sentence to clarify the direction of expected differences between younger and older populations: "Participants were from an older population, in which levels of physical activity are likely to be lower²¹ and experiences of weight discrimination are typically less common¹ relative to younger populations..." (p7).

18) Could a Health At Every Size approach be helpful given your findings? Focus on activity rather than weight?

- Response: Thank you for this suggestion. We have included a sentence on the Health at Every Size movement in our new paragraph that discusses interventions to improve health and take the focus off weight loss: "A Health at Every Size approach may be helpful in promoting the adoption of healthy habits, including regular physical activity, for the sake of health and wellbeing as opposed to weight control.¹⁹" (p7).

Reviewer: 2

Introduction:

The authors do a decent job, given wording constraints, of outlining the some of the basics of the weight discrimination problem and its consequences. I would have liked to have seen inclusion of some of the longitudinal studies (given that this study was based on longitudinal data) that have already been conducted as well. These studies used smaller sample sizes, and were conducted over shorter timeframes, but have conclusions that are relevant to and supportive of the current study.

Two studies to also consider:

Vartanian and Porter, 2016

Seacat, Dougal and Roy 2014

- Response: Thank you for drawing our attention to these studies. We have not gone into detail on

results relating to eating behaviour as this is not the primary focus of the paper, but have cited them where we briefly discuss the adverse effects of weight stigma on weight-related behaviours: "...there is increasing evidence that weight discrimination may adversely affect weight-related behaviours, e.g. increasing intake of high-fat, high-calorie foods,⁵ decreasing dietary quality⁶ and limiting physical activity.⁷⁻¹¹" (p3).

Methods:

I certainly appreciate the use of a large, nationally representative sample. I have two significant concerns about these data that would need to be thoroughly addressed by the authors:

First, the authors make the claim that their measurement of weight status is more objectively measured and thus more accurate (presumably than existing studies). The problem with their statement is that the authors used wave 4 anthropometric data (2008-2009) to analyze discrimination data from wave 5 (2010-2011). While the gap in time is only one year, the authors need to temper their claim in the abstract about the overall accuracy of their weight measurement. They do acknowledge this limitation at the conclusion of the paper though.

- Response: We thank the reviewer for drawing our attention to this oversight. We have edited the strengths and limitations section below the abstract to take account of the elapsed time between measuring height and weight and collection of discrimination and physical activity data.

The second concern I have is with the actual assessment of weight discrimination. Considerable debate exists in the literature about the use of global measures of weight stigma and discrimination in cross-sectional assessments (e.g., Seacat, Dougal and Roy, 2014). It is possible that weight discrimination may be under-reported by participants as various cognitive factors (memory, recall biases) influence what is ultimately reported. I would like to see this more clearly addressed by the authors.

- Response: We now discuss limitations of the discrimination measure in our discussion: "Weight discrimination was determined by self-reports of past experiences and as a result may have been underreported due to memory or recall biases. Participants could attribute multiple reasons to experiences of discrimination; although by asking about a range of potential reasons for discrimination weight was not the obvious focus, which may have helped to avoid bias among heavier respondents. The discrimination questions asked about five situations, but there are others that may be particularly relevant to weight discrimination (e.g. being viewed unfavourably as a potential romantic partner or having to pay more on public transport for occupying two passenger seats) and their omission may again mean that the prevalence of weight discrimination was underestimated." (p6).

In line with the previous concern is the global assessment of physical activity. At the very least, the authors need to temper their language and account for the possibility of inaccuracies given the nature of their assessment approach.

• Response: We have added the fact that analyses relied on global assessments of physical activity and discrimination as a limitation in our Strengths and Limitations section below the abstract: "Discrimination and physical activity were assessed alongside a vast number of other measures, minimising reporting bias, but both were self-reported global assessments which may be limited by inaccuracies in reporting." (p2). We have also edited the first paragraph of our discussion, where we summarise our key findings, to make clear that analyses were based on self-reported physical activity data: "Independent of differences in physical activity related to BMI, we saw that participants who reported weight-based discrimination were substantially more likely to report being sedentary, and less likely to report regularly engaging in moderately or vigorously energetic activities." (p6).

Results:

I may have missed this, but was there any consideration for prior physical activity levels among participants as a control in the present analyses? Please make this clear.

- Response: We did not control for prior physical activity levels because the way the discrimination items were worded did not allow us to determine when discriminatory experiences had occurred. We have raised this as a limitation in our discussion (p6).

A reported weight discrimination rate of 4.9% of participants over an entire year seems incredibly low. Studies in the US, UK and Australia have identified rates much higher than this. How do the authors rectify this finding with other studies demonstrating far higher rates of discrimination?

- Response: The observed prevalence of perceived weight discrimination in this sample was in fact very similar to results from comparable age groups in a previous large study conducted in the US, where rates were 5.3% in 55–64-year-olds and 4.0% in 65–74-year-olds (Puhl, Andreyeva, Brownell, 2008). We now highlight this in our discussion (p7). We have also provided more information on the prevalence of discrimination by weight status in the results section to show that while the overall prevalence of weight discrimination was just under 5%, in participants with obesity it was over 13%: “Perceived weight discrimination was reported by 4.9% of participants. Weight discrimination varied substantially by weight status ($p < .001$), rising from 0.8% in underweight and normal-weight participants ($n=1451$) and 0.9% in overweight participants ($n=2272$) to 13.4% in individuals with obesity ($n=1757$).” (p5).

The findings of the impact of weight discrimination on reported exercise are very intriguing. I am somewhat surprised by the lack of an interaction effect of BMI and discrimination though since other researchers have found that this relationship exists. Might this be due to the relatively low number of people actually reporting discrimination?

- Response: This is a good point – we have added this to our new paragraph discussing the null results of the interaction: “... it should be noted that very few (<1%) participants with a BMI <30 reported weight discrimination, so this analysis may have been underpowered.” (p6).

Discussion:

The discussion is well-written. As I mentioned though, the authors should address my aforementioned concerns about global assessments of weight discrimination (they do so somewhat for PA). The authors also need to address the low level of reported weight discrimination and the implications this might have had on the present findings.

- Response: As outlined in response to earlier comments, we have added discussion on the limitations of our measure of weight discrimination and the lower rate of weight discrimination observed in this sample compared to previous studies (p7).

Once again, we are grateful for your interest in the paper. We look forward to hearing your response.

VERSION 2 – REVIEW

REVIEWER	Jason Seacat Western New England University
REVIEW RETURNED	09-Jan-2017

GENERAL COMMENTS	<p>Title: Association between perceived weight discrimination and physical activity: A population-based study in English middle-aged and older adults</p> <p>Reviewer: Jason D. Seacat, Ph.D.</p> <p>Title- It may just be my semantic preference, but should wording be “among middle-aged...”</p> <p>Introduction- Lines 18-19: Authors should indicate the somewhat contradictory findings in the literature here since they state the purpose of the</p>
-------------------------	--

	<p>study was to resolve this issue. Line 36-37: In conjunction with previous comment, I would suggest authors use the word “help” resolve... Method- No issues. Statistical Analyses- No issues. Results- No issues. Discussion- -The authors mention a “health at every size approach” as a possible strategy to promote health behavior. At a minimum, there should be a citation for this position. While I tend to agree with the authors about the benefits of such an approach, care should be used in promoting one particular approach over others without documenting evidence for the efficacy of such an approach. The aforementioned approach is not one that is viewed skeptically by some members of the obesity science community. - The authors do an excellent job clarifying their findings and acknowledging the limitations of their current study. - Given the stated limitations, which I would expect, I would suggest that the authors temper their language ever so slightly in the final summary. I would suggest stating “may be associated with lower participation...”</p> <p>Overall, the authors did an excellent job on this piece.</p>
--	--

VERSION 2 – AUTHOR RESPONSE

Title- It may just be my semantic preference, but should wording be “among middle-aged...”

- Response: We have edited the title accordingly.

Introduction-

Lines 18-19: Authors should indicate the somewhat contradictory findings in the literature here since they state the purpose of the study was to resolve this issue.

- Response: This sentence now reads: “...there is increasing evidence that weight discrimination may adversely affect weight-related behaviours, e.g. increasing intake of high-fat, high-calorie foods,⁵ decreasing dietary quality⁶ and limiting physical activity,^{7–11} although findings have been somewhat contradictory.”

Line 36-37: In conjunction with previous comment, I would suggest authors use the word “help” resolve...

- Response: We have edited this line to read: “This study aimed to help resolve these discrepant findings...”

Method-

No issues.

Statistical Analyses-

No issues.

Results-

No issues.

Discussion-

-The authors mention a “health at every size approach” as a possible strategy to promote health

behavior. At a minimum, there should be a citation for this position. While I tend to agree with the authors about the benefits of such an approach, care should be used in promoting one particular approach over others without documenting evidence for the efficacy of such an approach. The aforementioned approach is not one that is viewed skeptically by some members of the obesity science community.

- Response: Thank you for this suggestion. We have added a citation for a paper showing evidence of long-term benefits of a health at every size intervention on eating behaviours, to support our position.

- The authors do an excellent job clarifying their findings and acknowledging the limitations of their current study.

- Given the stated limitations, which I would expect, I would suggest that the authors temper their language ever so slightly in the final summary. I would suggest stating “may be associated with lower participation...”

- Response: We have edited the text in line with this suggestion to read: “In summary, these results provide evidence that weight discrimination may be associated with lower participation in regular physical activity and higher rates of sedentary behaviour.”

Overall, the authors did an excellent job on this piece.

- Response: Thank you, we are grateful for all the useful comments provided.

Once again, we are grateful for your interest in the paper. We look forward to hearing your response.