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Gender differences in the relationship of weight-based stigmatisation with motivation to exercise and physical activity in overweight individuals

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Krystal M Sattler, Frank P Deane, Linda Tapsell and Peter J Kelly

Abstract

Weight stigma is related to lower levels of motivation to exercise in overweight and obesity. This study explored the nature of the relationship between stigma, motivation to exercise and physical activity while accounting for gender differences. Participants were 439 adults with overweight and obesity (mean body mass index = 32.18 kg/m^2, standard deviation = 4.09 kg/m^2). Females reported significantly more frequent stigma experiences than males. Mediation models found a conditional direct effect of weight stigma for males, with higher frequency of stigma experiences related to higher levels of walking and vigorous physical activity. A conditional indirect effect was found for females for walking, moderate and vigorous levels of physical activity, with higher weight stigma related to lower autonomous motivation, and lower levels of physical activity. Findings suggest that males and females are affected differently by weight-stigma experiences.

Keywords

gender, motivation, obesity, overweight, physical activity, weight stigmatisation

Weight-based stigmatisation occurs across education, employment, healthcare settings, interpersonal relationships and the media (Spahlholz et al., 2016; Vartanian et al., 2014). Weight stigma refers not only to negative attitudes and beliefs about an individual regarding their weight but also to the resulting perceived rejection, prejudice and discrimination that arise from these stereotypes and beliefs (Spahlholz et al., 2016). Stigmatising experiences include negative comments from others (e.g. 'you're fat'), physical barriers (e.g. not being able to fit into seats), being stared at, being excluded or ignored, job discrimination and difficulty establishing interpersonal relationships due to weight (Myers and Rosen, 1999). It affects both males and females and comes from peers, family, the general public, and health and fitness professionals (Robertson and Vohora, 2008; Schwartz et al., 2003).).

Weight-stigma experiences have been associated with higher levels of psychological distress, increased caloric intake and binge eating (Ashmore et al., 2008; Schvey et al., 2011). Past experiences of weight-based stigmatisation may reduce an individual's willingness to enter situations where they fear further discrimination (Vartanian and Novak, 2011), including exercise settings, such as gyms, and healthcare and medical settings (Schwartz et al., 2003; Vartanian and Novak, 2011). As weight stigma increases, the risk for both becoming and remaining obese increases (Sutin and Terracciano, 2013). Health risks associated with overweight and obesity include cardiovascular disease and Type 2 diabetes (Guh et al., 2009). However, just a 5 per cent reduction in body weight in individuals with obesity can result in significant improvements in risk factors associated with these medical conditions (Magkos et al., 2016). As such, a greater

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understanding of factors that can contribute to weight concerns is essential to facilitate effective engagement in treatment aimed at reducing obesity and health risks. This study aims to determine whether the relationship between weight-related stigma and physical activity is mediated by level of autonomous motivation to exercise and whether these relationships vary for males and females.

Weight-based stigmatisation and obesity

Research utilising retrospective measures has found that weight-based stigma experiences are reported to occur in overweight and obese samples on average ‘once in a lifetime’, with mean values ranging in frequency from ‘never’ to ‘once per month’ (Myers and Rosen, 1999; Vartanian and Novak, 2011; Vartanian and Shaprow, 2008). Studies utilising daily diary assessments report much higher rates of stigma experiences in overweight and obese individuals. One study of 50 women found an average of three weight-stigma experiences daily over a 1-week period (Seacat et al., 2016), while two studies including male and female participants found averages of 2.4 and 11 stigma events over a 2-week period (Carels et al., 2017; Vartanian et al., 2014).

As weight increases, so do weight-related stigma experiences (Spahlholz et al., 2016; Vartanian and Novak, 2011). Individuals within the severely obese range of body mass index (BMI) of 40 kg/m^2 or greater reported significantly more stigmatising situations than those with a BMI less than 40 kg/m^2 (Myers and Rosen, 1999). Small-to-medium positive correlations have been found between the frequency of stigma experiences and weight among samples with BMIs in the ‘obese’ range (BMI > 30) (Ashmore et al., 2008; Puhl and Brownell, 2006; Vartanian and Novak, 2011; Wott and Carels, 2010). Although correlations have been found between stigma experiences and weight in overweight and obese samples, they have also been identified in samples where individuals are not overweight. For example, in a sample of 100 female university students with 75 per cent in the ‘healthy’ BMI range, 85 per cent of the sample reported experiencing some form of weight stigma.

There are mixed findings in the literature on whether males and females experience different rates of weight-based stigma and related discrimination. Some studies find no difference in reported rates (Jackson et al., 2014; Puhl and Brownell, 2006; Salwen et al., 2015; Vartanian, 2015; Vartanian et al., 2014; Vartanian and Novak, 2011;), while others have found females experience higher rates of weight stigma and discrimination than males (Andreyeva et al., 2008; Eisenberg et al., 2003; Falkner et al., 1999; Fikkan and Rothblum, 2012; Hebl and Turchin, 2005; Puhl et al., 2008; Spahlholz et al., 2016). Females with higher BMIs have been found to have fewer dating and marriage prospects than females with lower BMIs, a relationship which is not replicated in males (Fikkan and Rothblum, 2012). There is also evidence to suggest that females who are overweight have lower incomes than their normal weight counterparts, with rates of discrimination increasing as BMI increases (Fikkan and Rothblum, 2012). Males who are overweight also experience income discrimination, but females experience discrimination at lower proportional weights than males, and males make up this difference over their careers while females do not (Fikkan and Rothblum, 2012).

Further to these gender differences in weight-related discriminatory experiences, research has shown differences in perceptions of weight status. Females perceive they are ‘overweight’ commencing at a lower BMI value than males (23.7 vs 26.1 kg/m^2) (Crawford and Campbell, 1999). Of concern is that the female-perceived ‘overweight’ value falls within the ‘healthy’ BMI range (18.5–24.9 kg/m^2), suggesting that females tend to rate themselves as more overweight than they are (Crawford and Campbell, 1999; Furnham et al., 2002). On the other hand, males define being ‘overweight’ at a cut-off higher than the current established cut-off of 25 kg/m^2 and display a tendency to underestimate their weight status (Crawford and Campbell, 1999; Furnham et al., 2002). These gender differences in perception of weight status and weight-based discrimination may contribute to a greater impact of stigma for females. This is because in the same way that being overweight is susceptible to perception and over- and underestimation, stigma experiences are also highly susceptible to perceptions by individuals. If males underestimate their weight status, they may be less susceptible (or sensitive) to stigma-related experiences because they do not view themselves as overweight. In contrast, if females overestimate their weight, then they may be more susceptible (sensitive) to stigma-related experiences (Hunger et al., 2015; Seacat and Mickelson, 2009).

Weight-based stigmatisation and physical activity

It could be argued that the relationship between weight-based stigma and physical activity is positively or negatively valenced. For example, stigma experiences may reduce physical activity due to associated shame. Alternatively, for some, stigma experiences may motivate them to make change and to engage in more physical activity in an effort to lose weight. The relationship between weight-stigma experiences and physical activity has not been consistently established in the research. Several studies failed to find a direct relationship between stigma experiences and physical activity in primarily female samples across both normal and obese BMI ranges (Schvey et al., 2016; Vartanian and Novak, 2011; Vartanian and Shaprow, 2008). One study in a youth sample with an average BMI in the ‘healthy’ range found that higher levels of weight criticism during physical activity was associated with lower levels of mild-intensity leisure activity; however, a similar relationship was not found for moderate or strenuous leisure activity (Faith et al., 2002). In contrast to these earlier research findings, Pearl et al. (2015) found a direct relationship with higher stigma associated with higher levels of physical activity in an overweight female sample. However, a mediation effect was also revealed for internalisation of weight stigma, where stigma experiences predicted higher levels of internalisation of weight bias and in turn predicted lower levels of exercise. These findings suggest that weight stigma and internalised weight stigma are likely to affect physical activity through mediating variables (Pearl et al., 2015).

Two studies involving female university students (average ‘healthy’ BMI, range ‘underweight’ to ‘obese’) and an adult community sample (average ‘obese’ BMI, range ‘healthy’ to’ obese’) have found that while weight-stigma experiences did not correlate with physical activity levels, they did demonstrate a relationship with motivation to avoid exercise (Vartanian and Novak, 2011; Vartanian and Shaprow, 2008). Stigmatising experiences were a unique predictor of motivation to avoid exercise in regression analyses in both studies. Furthermore, higher levels of exercise avoidance were related to lower levels of strenuous exercise in both studies, and moderate exercise in one (Vartanian and Shaprow, 2008). The authors speculated that this pattern of correlations may indicate a mediation process, where weight stigma leads to an indirect reduction in physical activity levels through its impact on motivation to exercise (Vartanian and Novak, 2011; Vartanian and Shaprow, 2008).

Motivation to engage in an activity is central to both initiation and maintenance of behaviour, and this is highly relevant to motivation to exercise or engage in physical activity. Self-Determination Theory (SDT) is one conceptual framework that has been utilised to explore how motivation to engage in physical activity predicts behavioural maintenance in weight loss (Silva et al., 2011). Key to the SDT is that motivation varies not only in amount but also in kind. Motivation is proposed to occur on a continuum, which ranges from more autonomous or intrinsic forms of motivation that are linked to values and enjoyment, to the more controlled or extrinsic motivations that are related to avoidance of consequences or to gain a reward (Deci and Ryan, 1985). There is evidence to suggest that increasing the more autonomous forms of motivation for exercise is associated with increased levels of exercise and weight control (Silva et al., 2011; Teixeira et al., 2012). Conversely, more controlled forms of motivation might be elicited by weight-related stigma experiences with efforts to avoid similar negative experiences resulting in lower levels of physical activity. Further research is needed to identify whether weight-related stigma experiences in individuals with overweight and obesity result in lower levels of autonomous motivation to exercise, and in turn impact level of physical activity.

The current study

The study aims to determine the extent to which weight-based stigma experiences, and motivation to exercise influence the level of physical activity (mild, moderate and vigorous types) in adults with overweight and obesity. It is hypothesised that the relationship between weight-related stigma and physical activity will be mediated by level of autonomous motivation to exercise. That is, higher weight-related stigma will be associated with lower motivation to exercise, which in turn will be associated with lower rates of physical activity. Furthermore, it is hypothesised that females will demonstrate a greater impact of stigma experiences on their motivation compared to males, resulting in less autonomous motivation to exercise and consequently lower levels of moderate and vigorous types of physical activity.

Methods

Study design

The data collected in this study were part of a larger research project known as the HealthTrack study. This research investigated the effect of a 12-month integrated multidisciplinary intervention for weight loss that incorporated diet, physical activity and psychological interventions (Tapsell et al., 2015). This study is cross-sectional and focuses on the baseline assessment sample of the HealthTrack study and includes all participants who completed the screening survey and baseline assessment phases. Interested community members responded to recruitment advertisements for individuals who were concerned about their weight and lifestyle to attend a clinic and receive professional input regarding their diet, physical activity and psychology elements. They completed an online screening survey, which included a range of demographic data, health and medical details, physical activity questions, food habits and psychological questions. Eligible participants were then asked to attend a baseline assessment session. Participants were included in this study if they were aged 25–54 years; living in the Illawarra region of New South Wales, Australia; and had a BMI of 25–48 kg/m^2 (corresponds to ‘overweight’ and ‘obese’ ranges). This included participants with Type 2 diabetes, hypertension and high cholesterol. The exclusion criteria were unable to communicate in English, have a severe medical condition, an impaired ability to participate in the study, immunodeficiency, medical conditions thought to limit survival to 1 year and illegal drug use or alcohol intake associated with alcoholism (>50 g/day). The average days between completion of the screening survey and baseline assessment were 25.74 (standard deviation (*SD*) = 14.37).

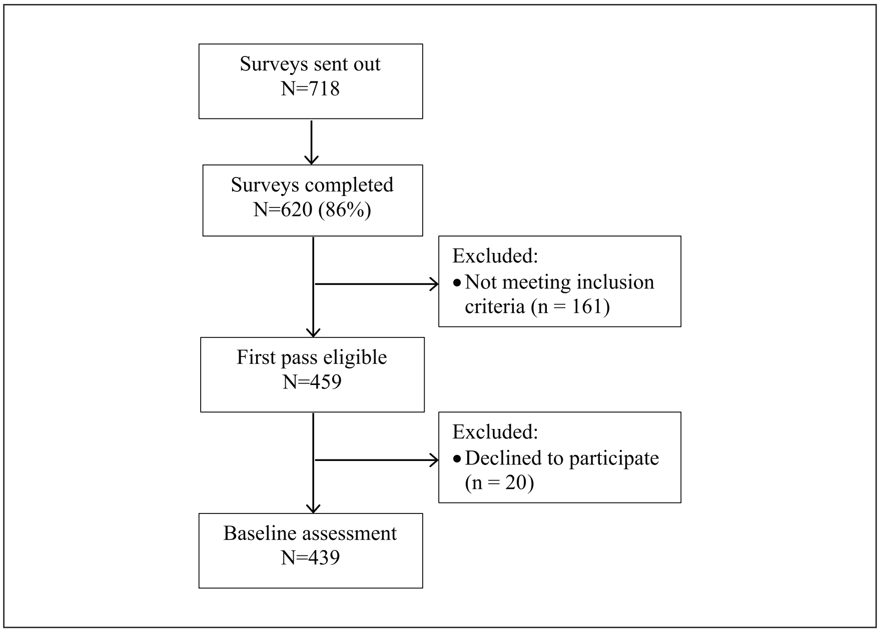

Figure 1. CONSORT flow diagram of participant recruitment across survey and baseline assessment time points.

The design, conduct and reporting of the HealthTrack study comply with the Consolidated Standards of Reporting Trials (CONSORT) guidelines (Schulz et al., 2010). The study met ethics approval by the University of Wollongong/Illawarra Shoalhaven Local Health District Human Research Committee (Health and Medical) (HE 13/189), and the study is registered with the Australian and New Zealand Clinical Trial Registry (ANZCTRN 12614000581662).

A total of 439 participants completed the screening survey and baseline assessment for the HealthTrack study between May 2014 and April 2015 (Tapsell et al., 2015). Figure 1 provides a CONSORT flow diagram of participants and recruitment. Participants' mean age was 42.86 years (*SD* = 8.10; range: 24–54 years). The majority of the participants were Australian-born (82%), female (73.6%) and married or living with a partner (76%). Annual income exceeded AUD$80,000 for 70 per cent of the sample, and approximately 50 per cent had at least a university degree. Mean BMI was 32.18 kg/m^2 (*SD* = 4.09; range: 24.61–48.13 kg/m^2). For further details on the baseline sample characteristics, refer to Tapsell et al. (2015).

Measures

The screening survey included demographic items (age, gender: male or female, racial/ethnic identity, highest level of education, socioeconomic status), self-reported weight and height measurements that were converted to BMI, the Brief Stigmatizing Situations Inventory (SSI-B; Vartanian, 2015) and the International Physical Activity Questionnaire–Short Form (IPAQ-SF; Craig et al., 2003). At baseline assessment, participants further completed the Behavioural Regulation of Exercise Questionnaire (BREQ-2R; Wilson et al., 2006).

Weight-related stigma. The SSI-B (Vartanian, 2015) is a 10-item self-report measure of lifetime experiences of weight-related stigma. The initial 50-item SSI was developed by Myers and Rosen (1999); however, due to the length of the measure, a shortened version was developed (Vartanian, 2015). The shorter versions of the SSI were found to be reliable and valid measures of weight-related stigma experiences (Vartanian, 2015). The SSI-B included items covering a range of sources of stigma including comments from doctors and children, physical barriers and negative assumptions from others (e.g. Having people assume that you overeat or binge-eat because you are overweight). Given the relatively low mean values and SDs found in previous research using the SSI (e.g. *M* = 1.90, *SD* = 2.0; Myers and Rosen, 1999), we reduced the response scale from a 10-point scale to an 8-point scale (excluding frequencies of 'several times per month' and 'daily'). Participants rated how often each situation has happened to them from 0 (never), 1 (*once in your life*), 3 (*about once a year*), to 7 (*several times per week*). Cronbach's alpha for SSI-B in this study was .86.

Physical activity levels. Level of physical activity was assessed using the IPAQ-SF (Craig et al., 2003). This measure asks participants to report the number of days out of the past 7 they did at least 10 minutes of physical activity across three intensities: walking, moderate and vigorous. Example activities for the three intensities are provided, for example, 'heavy lifting, digging, aerobics, or fast bicycling', for the vigorous physical activity level. Participants are then asked to estimate how much time in minutes they usually spend on one of those days doing that intensity of activity. The scoring protocol for the IPAQ-SF (IPAQ, 2005) was used to complete data cleaning and to calculate the total number of minutes of activity in a week for each intensity level by multiplying the number of days and minutes. Consistent with previous research (Vartanian and Novak, 2011; Vartanian and Shaprow, 2008), walking, moderate and vigorous levels of activity are reported and analysed separately.

Motivation for exercise. The BREQ-2R is a 23-item self-report measure that assesses the motivational processes associated with physical activity consistent with SDT (Wilson et al., 2006). The BREQ-2R comprises six subscales measuring amotivation (e.g. I don't see the point in exercising), external (e.g. I exercise because other people say I should), introjected (e.g. I feel guilty when I don't exercise), identified (e.g. I value the benefits of exercise), integrated (e.g. I consider exercise consistent with my values) and intrinsic (e.g. I exercise because it's fun) exercise motivations. Participants respond to the question 'why do you exercise?' for each item using a 5-point scale ranging from 0 (*not true for me*) to 4 (*very true for me*). The BREQ measures have a variety of scoring protocols (see Wilson et al., 2012). This study uses the Relative Autonomy Index (RAI) where each scale is weighted depending on its location on the SDT continuum and then aggregated to form a single index that represents a person's degree of self-determination (Wilson et al., 2012). Higher scores reflect more autonomous or intrinsic motivation, while lower scores reflect more controlled or external motivations.

Overview of analyses

Data were first screened for missing values and outliers. Self-reported BMI was used for analyses because it was collected at the same time as all self-report measures but one (BREQ-2R). Correlation between the self-report BMI from the screening survey and the measured BMI at the baseline assessment was $r = .91$ ($p < .001$). The IPAQ walking, moderate and vigorous levels of physical activity were found to violate the assumptions of normality and homoscedasticity, so rank transformations were conducted to correct non-normality and are used in all analyses (Conover and Iman, 1981). Spearman's rho correlations were conducted to determine relationships between all study variables, where r of .10 is a 'small effect', .30 is a 'medium effect' and .50 is a 'large effect' (Cohen, 2016). Independent *t*-tests were used to assess for differences across gender on BMI, stigma and physical activity. Hierarchical regression was used given the previously described theoretical sequence of variables and to identify variables that contributed combined and unique variance to level of physical activity. The PROCESS macro (Hayes, 2013) was used to test whether weight-related stigma was indirectly related to physical activity levels via its effect on level of autonomous motivation to exercise and whether gender moderates this relationship. For each level of physical activity, values for the moderator of gender (male, female) were produced for the mediator BREQ-RAI. Conditional direct and indirect effects were calculated using bias-corrected bootstrapping ($n = 10{,}000$ replications), with 95 per cent confidence interval (CI) to determine significance.

Results

The average score on the SSI-B was 0.94 ($SD = 0.93$), corresponding to experiencing a specific weight-related stigma experience 'once in your life'. A significant gender difference was found ($t = -1.98$, $p = .049$), with female participants reporting a higher average frequency of stigma experiences ($M = 1.00$, $SD = 0.80$) than male participants ($M = 0.80$, $SD = 0.97$). The average BMI for females ($M = 32.02$, $SD = 4.18$) and males ($M = 32.63$, $SD = 3.7$) was not significantly different ($p = .171$). Males ($M = 109.73$, $SD = 183.10$) reported significantly more minutes of moderate physical activity than females ($M = 68.76$, $SD = 138.02$; $t = 2.15$, $p = .015$). The same pattern was found for vigorous activity, with males ($M = 80.14$, $SD = 146.36$) reporting significantly more minutes of activity than females ($M = 47.76$, $SD = 75.59$; $t = 2.23$, $p = .028$). Mean values and SDs for all study variables are reported in Table 1. Spearman's rho correlations between study variables are also reported in Table 1.

Regression analyses

Hierarchical regression analyses were conducted for the rank IPAQ walking, moderate and vigorous levels of physical activity. For each level of physical activity, the variables were stepped into the regression in the following blocks: (1) gender, and self-reported BMI; (2) SSI-B; and (3) BREQ-RAI. Unstandardised (B) and standardised (β) regression coefficients and squared semi-partial (or 'part') correlations (sr^2) for each predictor in the regression models are reported in Table 2.

Only the final step of the rank IPAQ walking model was significant and accounted for 3 per cent of the variability in rank IPAQ walking, $R^2 = .03$, adjusted $R^2 = .02$, $F(4, 410) = 3.24$, $p = .012$. The BREQ-RAI variable accounted for 3 per cent unique variance in the model. The final step of the rank IPAQ moderate model was also significant, accounting for 6 per cent of the variability in rank IPAQ moderate, $R^2 = .06$, adjusted $R^2 = .05$, $F(4, 406) = 6.41$, $p < .001$. The BREQ-RAI and gender variables accounted for 4 and 1 per cent, respectively, of unique variance in the model. The rank IPAQ vigorous model was also significant at the final

Table 1. Means, standard deviations and Spearman's rho for age, BMI, stigma experiences, motivation to exercise and physical activity.

		1	2	3	4	5	6	7
1. Age (years)		–	.06	−.13**	.00	.06	.04	−.09
2. Self-reported BMI			–	.45**	−.16***	.01	.00	−.02
3. SSI-B				–	−.15***	−.02	−.07	.04
4. BREQ-RAI					–	.15**	.20***	.40***
5. IPAQ – Walk (rank)						–	.14**	.14**
6. IPAQ – Moderate (rank)							–	.38***
7. IPAQ – Vigorous (rank)								–
M (*SD*)	Overall	42.86 (8.10)	32.18 (4.09)	0.94 (0.93)	7.76 (7.27)	205.12[a] (297.73)	79.82[b] (152.36)	56.38[c] (100.30)
	Male	42.50 (7.77)	32.63 (3.79)	0.80 (0.80)	7.97 (6.71)	195.83 (285.02)	109.73 (183.06)	80.76 (146.36)
	Female	42.99 (8.22)	32.02 (4.18)	0.99 (0.97)	7.69 (7.47)	208.51 (278.16)	68.76 (138.02)	47.76 (75.59)
Range		24–54	24.61–48.13	0–5.20	−15.33–24.0	0–1260	0–1260	0–900
N		439	433	434	436	419	415	417

BMI: body mass index; SSI-B: Brief Stigmatizing Situation Inventory; BREQ-RAI: Behavioural Regulation of Exercise Questionnaire–Relative Autonomy Index; IPAQ: International Physical Activity Questionnaire; *SD*: standard deviation.
[a]Median = 120.
[b]Median = 30.
[c]Median = 10.
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

Table 2. Summary of hierarchical regression analyses for variables predicting rank IPAQ walking, moderate and vigorous.

Variable	Rank IPAQ walking				
	B	*SE*	95% CI	β	sr^2
Gender	13.66	13.41	−12.70 to 40.01	.05	.00
BMI self-report	1.04	1.60	−2.10 to 4.19	.04	.00
SSI-B	.51	7.38	−14.00 to 15.01	.00	.00
BREQ-RAI	2.86**	0.83	1.23 to 4.49	.17	.03
$F(4, 410) = 3.24$, $p = .012$, $R^2 = .03$.					
Variable	Rank IPAQ moderate				
	B	*SE*	95% CI	β	sr^2
Gender	−31.66*	12.70	−56.62 to −6.70	−.12	.01
BMI self-report	.50	1.51	−2.47 to 3.47	.02	.00
SSI-B	.16	6.90	−13.40 to 13.73	.00	.00
BREQ-RAI	3.41***	.79	1.85 to 4.97	.21	.04
$F(5, 406) = 6.41$, $p < .001$, $R^2 = .06$.					
Variable	Rank IPAQ vigorous				
	B	*SE*	95% CI	β	sr^2
Gender	−14.84	11.73	−37.89 to 8.21	−.06	.00
BMI self-report	−.25	1.39	−2.99 to 2.48	−.01	.00
SSI-B	10.18	6.29	−2.19 to 22.55	.08	.00
BREQ-RAI	6.22***	.72	4.81 to 7.64	.40	.15
$F(4, 408) = 19.34$, $p < .001$, $R^2 = .16$.					

IPAQ: International Physical Activity Questionnaire; CI: confidence interval for odds ratio (OR); *SE*: standard error; BMI: body mass index; SSI-B: Brief Stigmatizing Situations Inventory; BREQ-RAI: Behavioural Regulation of Exercise Questionnaire–Relative Autonomy Index.
*$p < .05$; *** $p < .001$.

step, accounting for 16 per cent of the variability in rank IPAQ vigorous, $R^2 = .16$, adjusted $R^2 = .15$, $F(4, 408) = 19.34$, $p < .001$. The BREQ-RAI variable accounted for 14.9 per cent of unique variance in the model. Weight-based stigma experiences were not found to be a significant predictor in the regression analyses.

Mediation analyses

Three separate mediation analyses (Hayes, 2013) tested the hypothesis that the impact of weight-related related stigma on walking, moderate and vigorous physical activity levels would be mediated by level of autonomous motivation and moderated by gender. Mediation models were conducted for the IPAQ untransformed data and rank data with similar results, but results using the rank IPAQ results are reported for consistency.

Model for walking. The mediation model for rank IPAQ walking was significant with males and females demonstrating different pathways of effect. A conditional direct effect was found for males between stigma experiences and rank IPAQ walking ($B = 29.99$, $p = .034$, CI = 2.23–57.76), with higher rates of stigma experiences related to a higher amount of minutes per week of walking activity. In contrast, a conditional indirect effect was found for females ($B = −3.73$, CI = −8.40 to −0.92), with higher rates of stigma experiences related to lower levels of autonomous motivation for physical activity and consequently less reported walking physical activity.

Model for moderate physical activity. A direct effect was not found between stigma experiences and rank IPAQ moderate physical activity levels, with all 95 per cent CIs encompassing 0. However, a conditional indirect effect was found for females ($B= −5.97$, CI = −11.71 to −2.28), with females who experienced higher rates of stigma experiences reporting lower levels of autonomous motivation for physical activity and lower moderate physical activity levels.

Model for vigorous physical activity. The mediation model for rank IPAQ vigorous was also significant. A conditional direct effect was found for males between stigma experiences and rank IPAQ vigorous ($B = 26.54$, $p = .031$, CI = 2.44–50.62), with higher rates of stigma experiences related to a higher amount of minutes per week of vigorous activity. A conditional indirect effect was found for females ($B = -9.13$, CI = −15.74 to −4.06), with higher rates of stigma experiences related to less autonomous motivation for physical activity and consequently less vigorous physical activity.

These results demonstrate that higher levels of stigma experiences in males are related to a higher amount of minutes per week of walking and vigorous physical activity, irrespective of their level of autonomous motivation. However, females who experience higher levels of weight-related stigma report lower levels of autonomous motivation and consequently lower levels of all three types of physical activity.

Discussion

In this sample of adults who were overweight and obese, weight-related stigma experiences were reported to occur on average ‘once in your life’, which was consistent with rates reported in previous studies (Ashmore et al., 2008; Puhl and Brownell, 2006; Vartanian and Novak, 2011). Females reported a significantly higher frequency of stigma experiences than males, which supports findings of gender differences in stigma experiences in previous research (Andreyeva et al., 2008; Eisenberg et al., 2003; Falkner et al., 1999; Hebl and Turchin, 2005; Puhl et al., 2008; Spahlholz et al., 2016). The reported frequency of stigma experiences occurring at least once in a lifetime was 87 per cent for females and 75 per cent for males, while experiencing stigma at least once per month was 22 per cent for females and 17 per cent for males. In absolute terms, this difference in frequency of stigma experiences was, on average, small in that it was .99 for females (*once in your lifetime*) compared to .80 for males (between ‘*never*’ and ‘*once in your lifetime*’). It is notable that stigma experiences at seemingly low frequencies may have an impact on motivation or behaviour, which seems to suggest that even low-frequency stigma experiences may have substantial effects on individuals. The average BMI for both genders in this study was similar, suggesting either that females who are overweight experience more stigma than males who are overweight or that females are more vulnerable to the perception of weight stigma and therefore report higher rates. As elaborated below, this may be in part explained by gender differences in the internalisation of weight bias (Boswell and White, 2015; Pearl et al., 2014).

Prior research has not consistently identified a direct relationship between stigma and physical activity (Faith et al., 2002; Pearl et al., 2015; Vartanian and Novak, 2011; Vartanian and Shaprow, 2008). In the present study, physical activity (walking, moderate and vigorous) was not significantly correlated with stigma experiences. However, a major finding in this study was that for women the relationship between weight-related stigma and physical activity was mediated by level of autonomous motivation to exercise. Not only do females report higher rates of weight-based stigma than males, but these stigma experiences impact the quality of motivation to exercise in different ways across the genders, which in turn impacts on level of physical activity. For females, greater weight-related stigma experiences were associated with lower levels of autonomous motivation to exercise, which was in turn associated with lower levels of walking, moderate and vigorous physical activity. For males, stigma experiences did not have any impact on level of autonomous motivation. Rather, males demonstrated a direct relationship between stigma and both walking and vigorous physical activity, with greater stigma experiences associated with higher levels of these types of physical activity.

There are multiple models emerging that attempt to explain how these weight-related stigma processes might be operating on behaviour (Brewis, 2014; Hunger et al., 2015; Pearl et al., 2015; Seacat and Mickelson, 2009). For example, both the stereotype threat model (Seacat and Mickelson, 2009) and the weight-based social identity threat model (Hunger et al., 2015) propose that people who are aware of the risk of being perceived as overweight and being judged based on this characteristic of their identity are more susceptible to negative impacts of weight-based stigma experiences. Seacat and Mickelson (2009) found that priming for weight-related stereotype threat reduced self-efficacy for exercise and dietary behaviours in a sample of females who were overweight, which in turn resulted in lower exercise and dietary intentions. They concluded that weight-related stereotype threat might be preventing overweight individuals from engaging in healthy lifestyle programmes, including exercise and dietary behaviours. The results for females in this study are consistent with this model. Females who reported experiencing greater levels of weight-related stigma demonstrated lower levels of autonomous motivation to exercise, and lower levels of physical activity at all levels.

In contrast, our results for males were not consistent with the stereotype threat model in that males had a direct increase in walking and vigorous physical activity in relation to weight-related stigma. This raises questions whether there are different underlying mechanisms operating for females and males in this sample of individuals with overweight and obesity. More specifically, females may be more vulnerable to weight-related stereotype threat than males, leading to greater impact of weight-related stigma experiences on females than males. Research conducted in predominantly female samples has demonstrated that those who report higher levels of internalised weight stigma (i.e. self-directed stigma) have poorer physical and mental health–related quality of life (Latner et al., 2014), demonstrate attenuated changes in moderate physical activity levels in response to intervention (Mensinger and Meadows, 2017) and report reduced self-efficacy and motivation to exercise as well as lower reported levels of exercise behaviours (Pearl et al., 2015).

Individuals with high anti-fat attitudes and high internalisation of societal attitudes about attractiveness who experienced weight-based stigma have greater motivation to avoid exercise (Vartanian and Novak, 2011). In a mediation analysis, Pearl et al. (2015) found that weight-stigma experiences led to greater internalisation of weight bias, which in turn resulted in lower levels of exercise behaviour. These findings are consistent with this study, which found that women reported higher levels of weight-stigma experiences than males (despite similar average weights), reduced autonomous motivation for exercise and lower levels of physical activity at all levels. This study did not assess the cognitions that accompanied weight-stigma experiences and several processes could be at work (e.g. fear avoidance versus learned helplessness). For example, for females, the mediating role of autonomous motivation could reflect a 'why try' response (learned helplessness), where stigma experiences lead to reduced self-efficacy to engage in behaviours that could address the cause of the stigma (Pearl et al., 2015). Conversely, males in this study had higher walking and vigorous activity levels associated with weight stigma. This direct effect is consistent with findings that males demonstrate less internalisation of weight bias than females (Boswell and White, 2015; Pearl et al., 2014), and therefore, this meditational effect of internalisation on physical activity levels is less likely to occur. Although speculative, it is possible that the gender difference in this study reflects a differential coping strategy, where males respond to stigma as a challenge to be responded to in a more direct manner through increasing their vigorous physical exercise. There is a need for future research to clarify the differential processes involved in male and female responses to stigma experiences and how they affect motivation to exercise and ultimately physical activity. Potential variables of interest include self-efficacy and internalisation of weight stigma (including emotional responses).

There are limitations in this study. The sample consists of individuals who are motivated for weight loss as demonstrated by their enrolment in a weight-loss intervention. This may impact on their motivation to engage in physical activity and limits the generalisation of the results to non-treatment seeking individuals who are overweight. The physical activity measure is a self-report instrument, which may be susceptible to recall bias and either over- or under-reporting of activity levels. Alternative explanations for the results of the study include that males may over-report their physical activity in response to stigma, or that females may under-report their physical activity levels in response to stigma. However, of note, the levels of moderate and vigorous physical activity in this study are consistent with other overweight samples seeking treatment (e.g. Silva et al., 2010) and in the community (e.g. Colley et al., 2011). Comparisons to population norms for walking physical activity were not conducted due to the variability in the definition of this type of activity across studies. Another limitation related to the different timeframes and construct match for the measures in the study. The stigma measure captures the frequency of stigma experiences in general, whereas physical activity is captured over the past 7 days. The motivation measure is related to exercise, whereas the activity measure is related to a broad range of physical activity of which exercise is just a subset. These variations are likely to reduce the strength of associations between measures.

Mediation suggests a causal process but caution needs to be used in the interpretation of the current results given the data are cross-sectional. Hayes (2013) argues that this should not preclude the use of mediation guided by theory or an argument supported by other research. Future research should include longitudinal measurement of physical activity levels, motivation to exercise and weight-related stigma across genders to allow further exploration of the stigma–physical activity relationship. Given the gender differences in physical activity levels and relationships with stigma, a greater understanding of the nature of physical activity across genders would be beneficial in future research, including whether males engage in more strenuous work and daily activities than females leading to greater incidental moderate and vigorous physical activity levels. There is also a need for further research including both males and females in samples, to determine whether differences in internalisation of weight bias between genders does lead to disparate coping strategies, and therefore differential motivation and physical activity levels. This may be captured by measuring internalised weight bias and anti-fat attitudes across genders and the relationship to weight-stigma experiences, motivation to exercise and physical activity, and would guide weight-loss interventions.

Conclusion

Even when weight-based stigma is experienced at low levels, it appears to have a relationship with motivation to exercise which in turn is associated with level of physical activity. Furthermore, these relationships appear to be more significant for females, who report higher levels of stigma experiences. As such, stigma is a potentially significant barrier to females engaging in physical activity. This has implications in terms of targeting treatment for females to ensure that the experience of weight-based stigma is directly addressed. In particular, the findings support the argument that weight-based stigma should be assessed and considered within weight-loss treatment planning (Lillis et al., 2009; O'Brien et al., 2016).

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