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Is Weight Stigma Associated with Physical Activity? A Systematic Review

Rebecca L. Pearl[1,2,*], **Thomas A. Wadden**[2], **John M. Jakicic**[3]

[1]Department of Clinical and Health Psychology, University of Florida, Gainesville, FL, USA

[2]Center for Weight and Eating Disorders, Department of Psychiatry, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, PA, USA

[3]Healthy Lifestyle Institute and Physical Activity and Weight Management Research Center, University of Pittsburgh, Pittsburgh, PA, USA

Abstract

Background: Weight stigma is associated with impaired health, attributed in part to reductions in health-promoting behaviors. This review analyzed evidence of the association between weight stigma and physical activity (PA) in adults and youth.

Methods: Three databases were searched for terms related to weight stigma and PA. Eligible studies reported the quantitative association between at least one measure of weight stigma and one behavioral measure of PA.

Results: Thirty-eight studies met eligibility criteria. Of the 29 studies of adults, three used objective PA measures and 79% used an observational, cross-sectional design. Findings of the relationship between weight stigma and PA were mixed. Everyday weight discrimination and internalizing weight stigma were associated with reduced PA in most studies. Several studies found indirect, and not direct, effects of weight stigma on PA when analyses included other individual-level factors. In the nine studies of youth, two used objective PA measures, all were observational, and only one study was longitudinal. Most youth studies found a relationship between weight-based teasing and reduced PA.

Conclusions: Weight teasing, everyday discrimination, and internalization were associated with reduced PA. However, associations were inconsistent and often indirect. Future studies should include objective PA measures with larger samples and longitudinal assessments.

Keywords

exercise; physical activity; stigma; weight-related discrimination; weight-related teasing

[*]Corresponding author Department of Clinical and Health Psychology, PO Box 100165, Gainesville, FL 32610-0165, rebecca.pearl@phhp.ufl.edu.

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Introduction

Weight stigma refers to the societal devaluation of persons perceived to have excess weight (i.e., overweight or obesity). This form of stigma stems from negative attitudes (i.e., bias) toward persons with a higher weight and common stereotypes that people with obesity are lazy and lack self-control (1). Individuals with a higher weight face discrimination (i.e., unequal treatment or denied opportunity) in educational, employment, and health care settings, as well as in family, peer, and other interpersonal relationships (2). Estimates suggest that approximately 1 in 5 adults with class I obesity reports experiencing weight discrimination in their lifetime, and over 40% of adults with class II/III obesity report this experience (3). In addition to discrete and blatant incidents of weight discrimination, stigma can pervade everyday life through subtle microaggressions in which people perceive differential treatment (e.g., treated with less courtesy or respect than others) due to their weight (4). Further, up to 70% of children and adolescents with a higher weight suffer weight-based victimization such as teasing (e.g., jokes made about weight), bullying (e.g., persistent harassment or physical threats or violence), and criticism from peers, parents, teachers, and other adults in their lives (5). In addition to experiencing weight stigma from others, a significant minority of individuals with overweight/obesity internalize weight bias and stigma by becoming highly aware of and agreeing (consciously or unconsciously) with negative weight stereotypes and attitudes, leading them to devalue themselves due to their weight (6).

Like other forms of stigma, weight stigma adversely affects health through multiple pathways (2). For example, discrimination reduces access to resources (e.g., financial, social, or health care resources), resulting in increased risk for poor health (7). Another proposed pathway from stigma to poor health is through greater engagement in unhealthy behaviors and reduced engagement in health-promoting behaviors as natural responses to stigma-related concerns and distress (8). Studies consistently show that weight stigma is associated with unhealthy eating behaviors, in part as a coping response to the stress of stigma (9). Experimental studies have provided further evidence of the causal relationship between exposure to stigma and increased consumption of high-caloric foods (10,11). Fewer studies have investigated how weight stigma may affect engagement or participation in the health-promoting behavior of physical activity (PA).

PA refers to bodily movement that results in increased energy expenditure; *exercise* is a form of PA that is performed in a planned, structured, and repetitive manner for the purpose of improving physical fitness (i.e., endurance, strength, flexibility, and body composition) (12). Many of the studies that have examined PA in relation to weight stigma have used qualitative methods or included motivational or attitudinal PA-related measures, such as self-efficacy (13,14,15). However, it is unclear whether links between weight stigma and motivational facets of PA translate into broad-scale reductions in PA among those who have experienced or internalized weight stigma. Qualitative research is integral to understanding the personal impact of stigma; quantitative data are required to generalize qualitative findings to the broader population and to determine whether weight stigma has a significant impact on PA. Knowledge of the relationship between weight stigma and PA is particularly important for obesity and exercise scientists and practitioners who, with greater awareness and training

(16,17), could be in positions to help individuals overcome PA barriers that may arise as a result of weight stigma. The current review aims to evaluate the state of the quantitative evidence on the association between weight stigma and engagement in PA.

Methods

Data collection and synthesis for this literature review were conducted in accordance with PRISMA guidelines for systematic reviews (18). This review was not pre-registered.

Eligibility Criteria

Studies were required to include at least one measure of weight stigma, or an experimental manipulation of weight stigma (including interventions to reduce stigma). Studies also had to include at least one behavioral measure of PA (i.e., a measure assessing engagement or participation in PA) and to report a quantitative association between weight stigma and physical activity in persons who are targeted by weight stigma (versus persons who hold weight-biased attitudes toward others but are not themselves the targets). Empirical studies were included if they were published in a peer-reviewed journal and available in English. Review papers, conceptual and commentary pieces, and qualitative studies were excluded from this review, as were conference proceedings, dissertations/theses, and chapters.

Search Strategy

Through the institutional online library, a combined search of Web of Science and Medline was conducted, along with a separate search of PsycInfo. Searches were conducted in July 2020 for any of the following terms pertaining to weight stigma and physical activity in the title, abstract, or keywords: “weight bias,” “weight stigma,” “weight discrimination,” “weight victimization,” “weight bullying,” OR “weight teasing” AND “physical activity,” “exercise,” “energy expenditure,” OR “sedentary” (to cast a wide net for potential studies, despite this latter term’s differentiation from PA). References of selected studies were also scanned for additional publications that may not have been indexed in the selected databases.

Study Selection

Duplicate studies were removed before screening titles and abstracts for exclusion/inclusion criteria. As depicted in Figure 1, initial screening eliminated review/conceptual/commentary papers; qualitative studies; papers that did not assess weight stigma, PA, or their association; and publications that were not full-text articles (e.g., conference abstracts). More thorough screening was used for the remaining articles to further exclude papers that did not include quantitative analyses of measures of weight stigma and PA. A final fine-grained screening was conducted to exclude studies that did not include a behavioral measure of PA (e.g., those that included motivational or attitudinal PA measures only). The first two study authors reviewed all abstracts independently and met to resolve discrepancies.

Data Abstraction, Synthesis, and Risk of Bias Assessment

The following information was extracted by the first author and summarized in a table across all studies: publication year; sample size and type (i.e., community versus clinical); study

design; study measures; and key findings. Studies that assessed weight stigma and PA in adults (age 18 years or older) versus youth (i.e., children and adolescents, <18 years old) were analyzed separately due to distinct stigma and PA measures used for each respective group, as well as practical differences in how weight stigma may impact PA (e.g., due to specific contexts in which weight stigma may occur and unique PA settings and activities). Assessment of study quality and risk of bias included in this review addressed the following factors: observational versus experimental design; cross-sectional versus longitudinal study design; self-report versus objective measurement of PA; sample size and characteristics; and validity of the weight stigma and/or physical activity measures. In addition to assessing risk of bias in each study, these factors were summarized with descriptive statistics to determine overall confidence in the body of evidence.

Results

Figure 1 displays the flow chart of study selection (see also Supplementary Table S1). A total of 38 studies were included in this review, divided into studies of adults (n=29) and of youth (n=9). Table 1 provides an overall summary of key findings, and Tables 2 and 3 provide more details of adult and youth studies.

Weight Stigma and PA in Adults

Twenty-three (79.3%) of the adult studies used observational and cross-sectional designs. Six studies included longitudinal assessments, ranging from 1 week to 6 months. Three studies used experimental designs in which weight stigma was manipulated to be heightened (19,20) or reduced (21). One study used a quasi-experimental design to test the effects of a fitness program developed to reduce weight bias and promote body acceptance (22). Eleven studies (38%) included clinical samples of patients undergoing bariatric surgery or in an internal medicine clinic, adults with type 2 diabetes, participants in weight loss or PA intervention studies, or members of a commercial weight loss program. The remaining samples included undergraduate students, national survey panels, online panels, or adults recruited from the community. Eight studies included women only, and one study was only of men.

Of the 29 adult studies, three used accelerometry to measure PA (23–25), 12 included the Godin Leisure-Time Exercise Questionnaire (GLTEQ) or a modified version (13,15,19–22,26–31), four included the short form of the International Physical Activity Questionnaire (IPAQ; 32–35), and three used interview items that assessed the frequency of different levels of PA (36–38). Even when using the same PA measure, studies varied in how outcomes were reported, such as with continuous versus dichotomous scoring (e.g., ever or never exercised), overall PA versus moderate-to-vigorous PA (MVPA), and minutes versus metabolic equivalent (MET) scores. Other validated scales used to measure PA included the Eating Disorders Examination-Questionnaire (assessing compensatory exercise; 39), the Red Lotus Quality of Life Questionnaire (40), and the Summary of Diabetes Self-Care Activities (41). One study included a measure of frequency of gym attendance that was not previously validated (42).

Studies of weight-stigmatizing experiences.—Seven studies included at least one subscale or adaptation of the Stigmatizing Situations Inventory (SSI; 13,19,21,28,35,43,44), four included the Everyday Discrimination Scale (EDS; in full or an abbreviated version; 36–38,41), and six included a set of three yes/no items assessing lifetime history of being discriminated against, teased or bullied, or treated unfairly due to weight (15,20,26,29–31). The SSI includes subscales that assess the frequency of different types of weight-stigmatizing situations and interpersonal sources of stigma (45). The EDS assesses microaggressions that may occur in everyday interactions, such as being treated with less courtesy than others or receiving poorer service at a restaurant (46). Other validated scales of weight stigma included the Fat Phobia Scale to assess stereotype endorsement, the Beliefs about Obese Persons scale to assess the belief that weight is controllable (15), and the Perceptions of Teasing Scale (POTS) to assess weight-based teasing (23).

Only one study of weight stigma experiences in adults utilized accelerometry. Boros et al. (23) found that, in a sample of 90 female college students, those who affirmed a history of weight-based teasing reported approximately 30 fewer minutes of current, weekly vigorous PA than those who did not report any history of weight teasing. No differences in moderate or overall PA were found between those with and without a history of weight teasing. Boros et al (23) did not account for current weight or BMI in the analyses.

No observational study that used self-reported PA measures found a significant, direct association between the SSI and PA (four included the GLTEQ and one the IPAQ), suggesting that frequency of weight-stigmatizing situations was not associated with PA. Han et al. (43) found that, among 298 patients post-bariatric surgery, SSI scores were *indirectly* associated with participant reports that they did not engage in PA, through a mediator of motivation to avoid exercise (i.e., more weight-stigmatizing experiences were associated with greater motivation to avoid exercise, which in turn was associated with more reported days of no PA). Similarly, in a moderated mediation model, Sattler et al. (35) found indirect effects of SSI scores on reduced IPAQ scores in women with overweight/obesity through a mediator of reduced autonomous (i.e., intrinsic) motivation to exercise. However, this study also found in the mediation model that SSI scores in men were associated with *more* vigorous PA and walking.

All four studies that included the EDS found significant associations with PA. In a study of 5,480 UK older adults, those who experienced weight discrimination, compared to those who did not, reported 60% greater odds of engaging in no or light activity on a weekly basis and 30% reduced odds of engaging in moderate to vigorous activity (36). Phibbs et al (37) also found that, among over 19,000 older adults, participants who had experienced weight discrimination reported by interview that they were approximately 20–25% less likely to obtain MVPA than those who did not report weight discrimination. Weight discrimination accounted for 9–13% of the variance in mediation models linking BMI to reduced MVPA. In a study of 168 adults with poorly controlled type 2 diabetes that accounted for demographics, BMI, depression and other forms of discrimination in the analyses, participants who had experienced weight discrimination reported exercising approximately 2 days per week, while those who were free of weight discrimination exercised approximately 3 days per week (41). Conversely, Udo et al (38) found that,

among over 21,000 US adults with obesity, women who had perceived weight discrimination reported *more* frequent PA than those who had not perceived it. Altogether, three studies showed negative associations between the EDS and PA, and one study showed a positive relationship. Three of these studies had samples of over 5,000 participants, and all studies appeared to have sufficient power to detect the small effects that were found.

Most studies that included the set of three yes/no items to assess weight stigma (coded as either yes/no or summed 0–3) did not find direct associations between stigma and PA. An exception was a study that found an association between weight stigma and *increased* PA as measured by the GLTEQ (15). Pearl & Dovidio (20) also found a significant moderation effect, such that experiencing weight stigma was associated with higher GLTEQ scores only when participants also reported a strong belief that the world is fair and just (a psychological predictor of responses to stigma). In other words, this study suggested that additional psychological factors may determine the relationship between experiences of weight stigma and engagement in PA.

The only other measure of weight stigma experiences that was found to be associated with PA was one of weight-related social control, or reported comments from others about the need to change one's diet and exercise habits. In a study of 399 undergraduates, Brunson et al. (47) found a negative correlation between these comments and PA among men ($r=-0.25$) and women ($r=-0.13$). Receiving these comments from parents in particular was associated with reduced PA. The total number of interpersonal sources of such comments did not predict PA.

Studies of internalized weight stigma.—Two of the 16 studies that assessed internalized weight stigma used objective PA measures (24,25), although one of these studies required participants to self-report output from an accelerometer rather than obtaining the objective data directly (25). In a study of 66 adults with overweight/obesity, Carels et al. (24) found no significant relationship between internalized weight stigma (measured with the Weight Bias Internalization Scale; WBIS) and daily steps measured by a Fitbit, or between WBIS scores and PA recorded in a daily diary. Carels et al. (25) assessed internalized weight bias in 46 adults with overweight/obesity enrolled in a weight loss study by measuring endorsement of positive and negative traits assigned to persons with obesity (measured with the Obese Persons Trait Survey) and the Weight Implicit Association Test (IAT) to assess implicit or unconscious weight bias. Participants who endorsed more negative traits of persons with obesity reported less daily energy expenditure (based on the output of their accelerometer) after 6 and 18 weeks of weight loss treatment. Negative implicit weight attitudes were also correlated with less energy expenditure at 6 weeks, and endorsement of positive traits of persons with obesity was associated with longer bouts of PA at 6 weeks (though no effects of either stigma measure were found at 18 weeks).

In addition to the study by Carels et al. (24), fourteen studies with self-report PA measures included the WBIS or a modified version. Six of these studies found direct associations between internalized weight stigma and reduced PA, as measured by the IPAQ or GLTEQ (26,29,31–34). Effect sizes were small across studies, and some studies interpreted these associations with caution or as non-significant due to large sample sizes (29,30). In addition

to cross-sectional associations, one longitudinal study found a significant interaction between WBIS scores and time, such that inactive women with obesity enrolled in a weight management program who had high levels of WBIS at baseline reported less increases in moderate PA over 6 months than did women with low levels of WBIS (40). Burnette & Mazzeo (39) also found a significant, positive association between WBIS-M scores and endorsement of compensatory exercise (measured by the EDE-Q) in a general sample of undergraduate men and women, although WBIS-M scores were associated with reduced frequency of compensatory exercise in men (and had no effect on frequency in women).

Two studies found internalized weight stigma to be a significant mediator between weight-stigmatizing experiences and reduced PA (15,26), and one study found it to mediate the relationship between general self-efficacy and MVPA (34). Han et al. (43) also found that WBIS scores were indirectly associated with reduced PA through motivation to avoid exercise. Four studies that included measures of both experiences and internalization of weight stigma found that WBIS scores, and not weight stigma experiences, had negative, direct associations with reduced PA, and these effects were significant over and above those of experiences (15,26,29,31). Internalized weight stigma did not moderate the relationship between stigmatizing experiences and PA.

Experimental studies.—The four studies that manipulated weight stigma to investigate causal effects on PA had either non-significant findings or results in the opposite direction as predicted (19,21,22,28). Lambert et al. (19) tested the effects of reading a weight-stigmatizing news story, compared to a control story, on PA in 172 women (of whom 81 had obesity). They found no significant effects of the experimental manipulation on GLTEQ scores 1 month later. An implicit retraining intervention, designed by Myre et al. (21) to challenge negative fitness-related stereotypes about women with obesity, also did not produce changes in GLTEQ scores 1 month later in women with obesity, nor did the training reduce internalized weight stigma. In another study, a small sample of middle-aged white women enrolled in a fitness program designed to reduce weight bias and promote body acceptance, compared to a non-randomized group of women not in the program, did not report significantly greater increases in GLTEQ scores over 3 months (22). Pearl et al (28) manipulated weight stigma by randomly assigning a community sample of 72 women to watch either a weight-stigmatizing or neutral video. When controlling for BMI, SSI scores interacted with the experimental manipulation: Participants who viewed the stigmatizing video and reported greater frequency of past weight stigma experiences scored higher on the GLTEQ 1 week later, compared to those in the stigma condition who had lower SSI scores. Thus, experimental studies of the acute effects of weight stigma on PA, conducted in small samples of women, have suggested either null effects of weight stigma on PA, or a positive relationship such that weight stigma predicted more self-reported PA.

Weight Stigma and PA in Youth

Of the nine studies of youth, all were observational and cross-sectional except for one, which included a 1-year assessment of 108 fourth and fifth graders (48). Six studies recruited participants from school systems, two from weight clinics, and one from a national survey panel. Most studies included a measure of weight-related teasing, such as the POTS

(49–51) or the Social Life subscale of the Impact of Weight on Quality of Life for Kids (52). Two studies included the Weight Criticism During Physical Activity Scale (WCA; 49) or a modified version (51), and another adapted items from this scale but did not specify that the teasing was weight-related (48). Similarly, Storch et al (53) included the Schwartz Peer Victimization Scale as a general measure of teasing among children (not necessarily related to weight), although the sample included only children in the 85th-95th BMI percentiles. Faith et al. (49) also included the Children's Coping Strategies Checklist-Revision 1, adapted to assess coping with weight criticism.

Only one youth study used accelerometry (Table 3). In a sample of 95 12–14 year-olds, Watanabe et al (51) found no significant relationship between general weight teasing (measured by the POTS), or weight teasing specifically during PA, on any intensity of PA. This study did not include any covariates, such as weight status. Greenleaf et al. (54) assessed physical fitness in 1419 middle school students using a standardized test battery of a progressive aerobic cardiovascular endurance run (PACER), curlups, pushups, and a sit-and-reach test. Physical fitness is not a direct measure of PA, but it represents a major goal of exercise and is associated with the amount and intensity of PA obtained (55,56). This study found that, when controlling for demographic characteristics, BMI, and pubertal development, participants who reported that they had "ever been teased for weighing too much" by family or friends had poorer fitness as measured by the PACER and pushups (with medium effect sizes), but not curlups or sit-and-reach.

Self-report measures of PA varied considerably and included: the Godin-Shepard Physical Activity Survey (49), items from the Youth Risk Behavior Survey (57), the Fels Physical Activity Questionnaire (47), the Leipzig Lifestyle Questionnaire for Adolescents (50), the PACE+ Adolescent Physical Activity measure (53), and the Branched Eating Disorders Test assessing whether or not participants had exercised to control their weight (58). One study used an interview (administered by an exercise specialist) to determine whether or not adolescents participated in extracurricular PA (52).

At least one, negative association between weight teasing and self-reported PA was reported in most studies. Faith et al. (49) found this association for mild intensity PA but not MVPA, and Losekam et al. (50) found this association for boys but not girls. In both studies, effect sizes were small. The 1-year longitudinal study by Jensen et al. (48) yielded mixed results: Teasing and PA were correlated cross-sectionally at the 1-year follow-up, but teasing at baseline was not correlated with PA at baseline or 1 year later. Valois et al. (52) found an association between participation in PA and better weight-related social life (i.e., less teasing). The authors suggested that PA participation improves weight-related social life, rather than less teasing promotes PA participation. Because all of the youth studies were observational (and all but one cross-sectional), it is not possible to draw conclusions about causality or directionality of effects.

In addition to measures of teasing, one study included a measure of body discrimination (57), and another included the Weight IAT as a proxy for expectation or threat of stigmatization (57). Sutin et al. (58) found that, among almost 3000 Australian adolescents, participants who reported experiencing body discrimination in the past 6 months had 37%

greater odds of reporting that they exercised for weight control. In a study of 302 high school students, the Weight IAT was not associated with PA, and a model testing the path from BMI to PA through IAT scores, stress, and coping was not significant (57).

Discussion

This systematic review summarized the findings from 29 studies of adults and nine studies of youth, all of which examined the relationship between weight stigma and engagement in PA. Findings across studies varied in both the significance and direction of the relationship, with the most robust negative associations emerging between PA and weight teasing (particularly in youth), subtle or everyday experiences of weight discrimination, and internalization of weight stigma. Other measures of weight stigma, such as the frequency of blatant stigmatizing experiences in adulthood, and experimental exposure to weight stigma, did not negatively impact reported PA.

The most robust associations between weight-stigmatizing experiences and PA in adults were found in studies that divided participants into those who had ever versus never experienced subtle forms of weight discrimination, namely measured with the EDS (36–38,41). Due to its capacity to measure multiple forms of discrimination, the EDS has been included in several large epidemiological studies (59), including studies highlighted in this review. The larger sample sizes may account for the more consistent significant findings. However, one of these studies found a positive association between stigma and PA (38), and two of the studies only assessed older adults (36,37), so the generalizability of this finding is unclear.

In contrast, frequency of stigmatizing experiences (assessed with the SSI) was not associated with PA. Similarly, experimental studies that either exposed participants to weight stigma or attempted to reduce its internalization (through brief interventions) did not find causal effects on PA, except for one study that showed an acute increase in PA among those who also had more frequent weight-stigmatizing experiences. Sample sizes in all experimental studies were relatively small, with even fewer participants who had overweight/obesity, thus lowering statistical power to detect significant differences in the target group.

Several of the studies that found no significant direct associations between weight stigma experiences and PA did highlight indirect or conditional effects in larger mediation models that included measures of motivation or other psychological factors. The relationship between weight stigma and PA is likely complex and dependent on factors such as orientation toward or experience with PA, coping responses to weight stigma, sociocultural environment, and individual differences in cognitive and affective traits. This relationship also may not be easily captured cross-sectionally, since some of these factors may develop or change over time. Longitudinal studies that assess weight stigma across the lifespan could provide greater insights than acute assessments of stigma.

The internalization of weight-biased attitudes, stereotypes, and derogatory beliefs may represent one type of cognitive response to stigmatizing experiences that determines engagement in PA. Approximately half of the studies of internalized weight stigma showed

significant, direct associations with reduced PA. Several studies found these relationships when controlling for experiences of weight stigma, and WBIS scores did not moderate the effects of stigmatizing experiences on PA. Internalized weight stigma was also found to partially mediate the relationship between stigmatizing experiences and PA. Taken together, these findings suggest that internalization may be a key component of weight stigma that influences PA and, thus, warrants further attention. This is consistent with other studies that have found internalized weight stigma to be a stronger predictor of negative outcomes for eating, weight management, and health-related quality of life than experiences of stigma alone (29,60,61). Only one study in this review found WBIS scores to be positively correlated with PA (39). This study assessed compensatory exercise in a college sample with an eating disorders scale, signifying a positive relationship with a potentially unhealthy form of PA. Of note, college students tend to overreport compensatory exercise on this particular self-report measure, and the exercise item in isolation is not a strong indicator of eating disorder risk (62), so it is unclear how to interpret this relationship. Several PA measures were ambiguous in whether they represented a healthy versus pathological form of PA (e.g., “exercising for weight control” among adolescents; 58). This is particularly important to clarify when assessing PA in youth.

Prior work suggests that individuals are more prone to internalizing weight stigma if they had a higher body weight during youth and/or experienced weight-based teasing (63,64). Weight teasing was associated with reduced PA in the majority of youth studies included in this review, highlighting the potential impact of early life experiences with weight stigma on the development of health behaviors. It is possible that early experiences with weight stigma may continue to impact adults and their PA habits – especially if this stigma is internalized. As future population-based cohort studies are designed to assess changes in health from youth to adulthood, researchers may consider including measures of weight status, weight-based teasing, internalized weight stigma, and PA (assessed through interview self-report and objective measurement), in order to investigate the temporal relationship between weight stigma in youth and subsequent internalization and PA patterns in adulthood while controlling for baseline PA and weight status.

Given the heterogeneity of weight stigma measures, PA outcomes, and sample characteristics and covariates, along with the predominance of observational and cross-sectional studies, the risk of bias was high. Of the five studies that included an objective measure of PA or fitness, three studies showed small yet significant associations between weight teasing or internalized weight bias and minutes of vigorous PA, energy expenditure, or physical fitness. Otherwise, over 85% of studies relied solely on self-report surveys to assess PA, with most measures capturing volitional or structured exercise (versus energy expenditure more broadly). Although many studies used validated and widely-used self-report scales, such as the GLTEQ and IPAQ, self-reported PA is prone to significant bias in both under- and over-reporting, and confidence in such data can vary based on the level of PA intensity and methods of assessment (65,66). For example, in the study by Hubner et al (34) included in this review, candidates for bariatric surgery reported by survey that they obtained an average of 380 minutes per week of vigorous activity, 290 minutes per week of moderate activity, and over 600 minutes per week of walking. These values exceed the World Health Organization PA guidelines, which most adults do not

meet, and are much higher than estimates of MVPA in bariatric samples as measured by accelerometry (67–70). The potential bias of self-report PA measures highlights the importance of incorporating more objective measures in this area of research, which would also provide more information on energy expenditure from PA apart from intentional, structured exercise.

Notably, approximately 90% of studies included in this review were published within the past 10 years. This nascent area of research could be further advanced in several ways. First, self-report data need to be supplemented by objective measures of PA and fitness. Experts in obesity and exercise science are well-suited to contribute to this area of research by bringing gold-standard PA measures to a literature that has largely been led by social scientists. Among both objective and self-report PA measures, greater standardization of reporting (e.g., MVPA versus total METs) would help to create an evidence-base from which meta-analyses could be conducted. Limiting the heterogeneity of self-report weight stigma measures in this literature may be achieved by including scales with the most consistent associations with PA, which in this review were the widely-used and validated EDS, WBIS, and POTS.

As previously mentioned, prospective research is needed to determine the temporal relationship between weight stigma and PA. To establish causal effects, further development is needed of potent experimental manipulations of weight stigma (without causing psychological harm to participants with overweight/obesity), such as through in-vivo or imaginal exposure, interpersonal rejection paradigms, or writing prompts to elicit thoughts and feelings of internalized stigma. Pairing such experimental designs with objective and self-report PA outcome measures assessed acutely and with short-term follow-up, while accounting for baseline PA and weight status in an adequately powered sample, would represent the optimal studies for determining causality. Finally, recent studies have shown promising advances in the development of psychological interventions designed to reduce internalized weight stigma using cognitive-behavioral or acceptance-based therapies (71–74); testing the effects of such interventions on PA would advance understanding of how alleviating the burden of weight stigma may affect health behaviors.

Should further research determine a clearer connection between weight stigma and reduced PA, this information would be relevant to obesity specialists and to PA educators and practitioners who are in positions to help individuals with a higher weight develop and maintain a positive, healthy relationship with PA. Among youth, weight-related teasing and bullying often occur in physical education or sports settings (75). Fitness educators must not only intervene when they witness peer victimization, but may also need to explicitly communicate an inclusive environment for youth of all sizes in order to prevent those with a higher body weight from avoiding such settings and activities. This may require greater education and training among PA professionals to be able to identify and eliminate expressions of weight bias in their interactions and environments (16,17,76). Obesity and exercise specialists who work predominantly with adults may also benefit from greater awareness of their own biases (16), as well as the deeply ingrained, self-derogatory beliefs held by some adults with obesity about their weight and ability to be active that can be a barrier to engaging in PA. If self-consciousness and expected judgment from obesity and

exercise professionals (perhaps based on past stigmatizing experiences) keep individuals with a higher weight from being active, a broader cultural shift will be needed to create settings in which everyone, regardless of size, feels comfortable and empowered to engage in regular PA.

Limitations of the review process include restricting the search to three biomedical and psychological databases; studies from other disciplines may have been missed in the review process. An a priori exclusion of qualitative studies was made in order to focus on quantifiable relationships between weight stigma and PA that may generalize to broader populations; however, this exclusion meant that valuable hypothesis-generating findings from such studies were not incorporated into the current review. This review also did not include studies focused on body image, which is distinct from yet related to weight stigma and its internalization (77) and has been examined more extensively in relation to PA (78). Prior findings pertaining to PA, body dissatisfaction, and other factors related to eating disorders (including compulsive exercise) may inform understanding of the relationship between weight stigma and PA (79). More stringent inclusion criteria in relation to study quality (e.g., sample size) were not imposed due to prior knowledge of the limited number of studies on this topic. Inclusion of studies with high risk of bias limits confidence in the findings, as highlighted throughout this review. A final limitation is that this review was not pre-registered.

Conclusion

Weight teasing (particularly in youth), everyday weight discrimination, and the internalization of weight stigma are associated with reduced PA. However, findings have been inconsistent and based largely on studies using self-report measures and observational, cross-sectional designs. Research investigating the effects of weight stigma on PA warrants as much scientific rigor as other topics in the field of exercise science. Understanding the relationship between weight stigma and PA could have implications for intervention by obesity and exercise professionals in schools, fitness settings, and weight management programs. Addressing these concerns within the context of these settings, with a particular focus on training in this area for obesity and exercise scientists and interventionists, may result in enhancement of PA engagement that can result in clinical health benefits for both youth and adults.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

1. Crandall CS. Prejudice against fat people: ideology and self-interest. J Pers Soc Psychol. 1994;66:882–94. [PubMed: 8014833]
2. Pearl RL. Weight bias and stigma: Public health implications and structural solutions. Soc Issues Policy Rev. 2018;12(1):146–82.
3. Spahlholz J, Baer N, Konig HH, Riedel-Heller S, Luck-Sikorski C. Obesity and discrimination: A systematic review and meta-analysis of observational studies. Obes Rev. 2016;17:43–55. [PubMed: 26596238]
4. Vartanian LR, Pinkus RT, Smyth JM. The phenomenology of weight stigma in everyday life. J Context Behav Sci. 2017;3:196–202.
5. Pont SJ, Puhl R, Cook SR, Slusser W, The Obesity Society. Stigma experienced by children and adolescents with obesity. Pediatrics. 2017;140(6).
6. Durso LE, Latner JD. Understanding self-directed stigma: Development of the Weight Bias Internalization Scale. Obesity. 2008;16:S80–6. [PubMed: 18978768]
7. Hatzenbuehler ML, Phelan JC, Link BG. Stigma as a fundamental cause of population health disparities. Am J Public Health. 2013;103(5):813–21. [PubMed: 23488505]
8. Tomiyama AJ, Carr D, Granberg EM, Major B, Robinson E, Sutin AR, et al. How and why weight stigma drives the obesity “epidemic” and harms health. BMC Med. 2018;16(123).
9. Vartanian LR, Porter AM. Weight stigma and eating behavior: A review of the literature. Appetite. 2016;102:3–14. [PubMed: 26829371]
10. Schvey NA, Puhl RM, Brownell KD. The impact of weight stigma on caloric consumption. Obesity. 2011;19:1957–62. [PubMed: 21760636]
11. Major B, Hunger JM, Bunyan DP, Miller CT. The ironic effects of weight stigma. J Exper Social Psychol. 2014;51:74–80.
12. Liguori G, American College of Sports Medicine. Benefits and Risks Associated with Physical Activity. In: ACSM’s Guidelines for Exercise Testing and Prescription. Lippincott Williams & Wilkins; 2020.
13. Vartanian LR, Novak SA. Internalized societal attitudes moderate the impact of weight stigma on avoidance of exercise. Obesity. 2011;19(4):757–62. [PubMed: 20948515]
14. Schmalz DL. “I feel fat”: weight-related stigma, body esteem, and BMI as predictors of perceived competence in physical activity. Obes Facts. 2010 2;3(1):15–21. [PubMed: 20215791]
15. Pearl RL, Puhl RM, Dovidio JF. Differential effects of weight bias experiences and internalization on exercise among women with overweight and obesity. J Health Psychol. 2015;20(12):1626–32. [PubMed: 24505060]
16. Panza GA, Armstrong LE, Taylor BA, Puhl RM, Livingston J, Pescatello LS. Weight bias among exercise and nutrition professionals: A systematic review. Obes Rev. 2018;19:1492–503. [PubMed: 30176183]
17. Alberga AS, Pickering BJ, Hayden KA, Ball GDC, Edwards A, Jelinski S, et al. Weight bias reduction in health professionals: A systematic review. Clin Obes. 2016;6:175–88. [PubMed: 27166133]
18. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gotzsche PC, Ioannidis JPA, et al. The PRISMA Statement for reporting systematic reviews and meta-analyses for studies that evaluate health care interventions: Explanation and evaluation. PLos ONE. 2009;6(7):e1000100.
19. Lambert ER, Koutoukidis DA, Jackson SE. Effects of weight stigma in news media on physical activity, dietary and weight loss intentions and behaviour. Obes Res Clin Pract. 2019;13:571–8. [PubMed: 31735542]
20. Pearl RL, Dovidio JF. Experiencing weight bias in an unjust world: Impact on exercise and internalization. Health Psychol. 2015;34(7):741–9. [PubMed: 25401685]
21. Myre M, Berry TR, Ball GDC, Hussey B. Motivated, fit, and strong: Using counter- stereotypical images to reduce weight stigma internalisation in women with obesity. Appl Psychol Health Well-Being. 2020;12(2):335–56. [PubMed: 31714033]

22. Watkins PL, Ebbeck V, Levy SS. Overcoming weight bias: Promoting physical activity and psychosocial health. Ethn Inequalities Health Soc Care. 2014;7(4):187–97.
23. Boros P, Fontana F, Mack M. A comparison of physical activity engagement and enjoyment in female college students with and without a history of weight-related teasing. Coll Stud J. 2017;51(3):444–52.
24. Carels RA, Hlavka R, Selensky JC, Solar C, Rossi J, Miller JC. A daily diary study of internalised weight bias and its psychological, eating and exercise correlates. Psychol Health. 2019;34(3):306–20. [PubMed: 30587043]
25. Carels RA, Young KM, Wott CB, Harper J, Gumble A, Oehloff MW, et al. Weight bias and weight loss treatment outcomes in treatment-seeking adults. Ann Behav Med. 2009;37:350–5. [PubMed: 19548044]
26. Himmelstein MS, Puhl RM, Quinn DM. Overlooked and understudied: Health consequences of weight stigma in men. Obesity. 2019;27:1598–605. [PubMed: 31364819]
27. Koball AM, Mueller PS, Cramer J, Clark MM, Nanda S, Kebede EB, et al. Crucial conversations about weight management with providers: patients' perspectives and experiences. Eat Weight Disord. 2018;23:87–94. [PubMed: 27473870]
28. Pearl RL, Dovidio JF, Puhl RM, Brownell KD. Exposure to weight-stigmatizing media: Impact on exercise intentions, motivation, and behavior. J Health Commun. 2015;20(9):1004–13. [PubMed: 26222998]
29. Pearl RL, Puhl RM, Himmelstein MS, Pinto AM, Foster GD. Weight stigma and weight-related health: Associations of self-report measures among adults in weight management. Ann Behav Med. 2020;54(11):904–14. [PubMed: 32333673]
30. Puhl RM, Himmelstein MS, Pearl RL, Wojtanowski AC, Foster GD. Weight stigma among sexual minority adults: Findings from a matched sample of adults engaged in weight management. Obesity. 2019;27:1906–15. [PubMed: 31689008]
31. Puhl RM, Quinn DM, Weisz BM, Suh YJ. The role of stigma in weight loss maintenance among U.S. adults. Ann Behav Med. 2017;51:754–63. [PubMed: 28251579]
32. Cheng OY, Yam CLY, Cheung NS, Lee PLP, Ngai MC, Lin C-Y. Extended theory of planned behavior on eating and physical activity. Am J Health Behav. 2019;43(3):569–81. [PubMed: 31046887]
33. Feig EH, Amonoo HL, Onyeaka HK, Romero PM, Kim S, Huffman JC. Weight bias internalization and its association with health behaviour adherence after bariatric surgery. Clin Obes. 2019;10:e12361.
34. Hubner C, Baldofski S, Zenger M, Tigges W, Herbig B, Jurowich C, et al. Influences of general self-efficacy and weight bias internalization on physical activity in bariatric surgery candidates. Surg Obes Relat Disord. 2015;11(6):1371–6.
35. Sattler KM, Deane FP, Tapsell L, Kelly PJ. Gender differences in the relationship of weight- based stigmatisation with motivation to exercise and physical activity in overweight individuals. Health Psychol Open. 2018;1–11.
36. Jackson SE, Steptoe A. Association between perceived weight discrimination and physical activity: A population-based study among English middle-aged and older adults. BMJ Open. 2017;7:e014592.
37. Phibbs S, Thoburn S, Branscum AJ. Is weight discrimination associated with physical activity among middle aged and older adults? J Prim Prev. 2019;40:279–95. [PubMed: 30895424]
38. Udo T, Purcell K, Grilo CM. Perceived weight discrimination and chronic medical conditions in adults with overweight and obesity. Int J Clin Pract. 2016;70:1003–11. [PubMed: 28032427]
39. Burnette CB, Mazzeo SE. Examining the contribution of weight-bias internalization to the associations between weight suppression and disordered eating in undergraduates. Eat Behav. 2020;37:101392. [PubMed: 32413732]
40. Mensinger JL, Meadows A. Internalized weight stigma mediates and moderates physical activity outcomes during a healthy living program for women wtih high body mass index. Psychol Sport Exerc. 2017;30:64–72.

41. Potter L, Wallston K, Trief P, Ulbrecht J, Juth V, Smyth J. Attributing discrimination to weight: associations with well-being, self-care, and disease status in patients with type 2 diabetes mellitus. J Behav Med. 2015;38:863–75. [PubMed: 26133488]
42. Schvey NA, Sbrocco T, Bakalar JL, Ress R, Barmine M, Gorlick J, Pine A, Stephens M, Tanofsky-Kraff M. The experience of weight stigma among gym members with overweightand obesity. Stigma Health. 2017 11;2(4):292.
43. Han S, Agostini G, Brewis AA, Wutich A. Avoiding exercise mediates the effects of internalized and experienced weight stigma on physical activity in the years following bariatric surgery. BMC Obes. 2018;5:18. [PubMed: 29988619]
44. Vartanian LR, Shaprow JG. Effects of weight stigma on exercise motivation and behavior: a preliminary investigation among college-aged females. J Health Psychol. 2008;13(1):131–8. [PubMed: 18086724]
45. Myers A, Rosen JC. Obesity stigmatization and coping: Relation to mental health symptoms, body image, and self-esteem. Int J Obes. 1999;23:221–30.
46. Williams DR, Yu Y, Jackson JS, Anderson NB. Racial differences in physical and mental health: Socioeconomic status, stress, and discrimination. J Health Psychol. 1997;2(3):335–51. [PubMed: 22013026]
47. Brunson JA, Overup CS, Nguyen M-L, Novak SA, Smith CV. Good intentions gone awry? Effects of weight-related social control on health and well-being. Body Image. 2014;11:1–10. [PubMed: 24051225]
48. Jensen CD, Cushing CC, Elledge AR. Associations between teasing, quality of life, and physical activity among preadolescent children. J Pediatr Psychol. 2014;39(1):65–73. [PubMed: 24293370]
49. Faith MS, Leone MA, Ayers TS, Heo M, Pietrobelli A. Weight criticism during physical activity, coping skills, and reported physical activity in children. Pediatrics. 2002;110(2):e23. [PubMed: 12165622]
50. Losekam S, Goetzky B, Kraeling S, Rief W, Hilbert A. Physical activity in normal-weight and overweight youth: Associations with weight teasing and self-efficacy. Obes Facts. 2010;3:239–44. [PubMed: 20823687]
51. Watanabe PI, Fontana FE, Pereira da Silva M, Mazzardo O, Bacil EDA, de Campos W. Association between weight-teasing and physical activity in adolescents. Rev Paul Pediatr Sao Paulo Pediatr J. 2017;35(3):309–15.
52. Valois DD, Lamb M, Bowker A, Rutherford J, Buchholz A. Extracurricular activity involvement and body image in youth with obesity: The mediating role of social life. Child Obes. 2019;15(7):426–33. [PubMed: 31298553]
53. Storch EA, Milsom VA, DeBraganza N, Lewin AB, Geffken GR, Silverstein JH. Peer victimization, psychosocial adjustment, and physical activity among overweight and at-risk- for-overweight youth. J Pediatr Psychol. 2007;32(1):80–9. [PubMed: 16601255]
54. Greenleaf C, Petrie TA, Martin SB. Relationship of weight-based teasing and adolescents' psychological well-being and physical health. J Sch Health. 2014;84(1):49–55. [PubMed: 24320152]
55. Stofan JR, DiPietro L, Davis D, Kohl HW, Blair SN. Physical activity patterns associated with cardiorespiratory fitness and reduced mortality: The Aerobics Center Longitudinal Study. Am J Public Health. 1998;88:1807–13. [PubMed: 9842378]
56. Bailey DP, Boddy LM, Savory LA, Denton SJ, Kerr CJ. Associations between cardiorespiratory fitness, phsical activity and clustered cardiometabolic risk in children and adolescents: the HAPPY study. Eur J Pediatr. 2012;171:1317–23. [PubMed: 22419363]
57. Hand WB, Robinson JC, Stewart MW, Zhang L, Hand SC. The identity threat of weight stigma in adolescents. West J Nurs Res. 2017;39(8):991–1007. [PubMed: 28436266]
58. Sutin AR, Stephan Y, Robinson E, Daly M, Terracciano A. Body-related discrimination and dieting and substance use behaviors in adolescence. Appetite. 2020;151.
59. Pascoe EA, Richman LS. Perceived discrimination and health: A meta-analytic review. Psychol Bull. 2009;135(4):531–54. [PubMed: 19586161]

60. O'Brien KS, Latner JD, Puhl RM, Vartanian LR, Giles C, Griva K, et al. The relationship between weight stigma and eating behavior is explained by weight bias internalization and psychological distress. Appetite. 2016;102:70–6. [PubMed: 26898319]
61. Latner JD, Barile JP, Durso LE, O'Brien KS. Weight and health-related quality of life: The moderating role of weight discrimination and internalized weight bias. Eat Behav. 2014;15:586–90. [PubMed: 25215477]
62. Schaumberg K, Anderson LM, Reilly E, Anderson DA. Patterns of compensatory behaviors and disordered eating in college students. J Am Coll Health. 2014;62(8):526–33. [PubMed: 24911417]
63. Pearl RL, Wadden TA, Tronieri JS, Chao AM, Alamuddin N, Bakizada AM, et al. Sociocultural and familial factors associated with weight bias internalization. Obes Facts. 2018;11:157–64. [PubMed: 29656285]
64. Pearl RL, Himmelstein MS, Puhl RM, Wadden TA, Wojtanowski AC, Foster GD. Weight bias internalization in a commercial weight management sample: Prevalence and correlates. Obes Sci Pract. 2019;5(4):342–53. [PubMed: 31452919]
65. Prince SA, Adamo KB, Hamel M, Hardt J, Gorber SC, Tremblay M. A comparison of direct versus self-report measures for assessing physical activity in adults: a systematic review. Int J Behav Nutr Phys Act. 2008 1 1;5(1):56. [PubMed: 18990237]
66. Sallis JF, Saelens BE. Assessment of physical activity by self-report: Status, limitations, and future directions. Res Q Exerc Sport. 2000;71(2):1–14.
67. World Health Organization. Global recommendations on physical activity for health. 2011. Available from: https://www.who.int/dietphysicalactivity/physical-activity-recommendations-18-64years.pdf?ua=1
68. Finger JD, Mensink GBM, Lange C, Manz K. Health-enhancing physical activity during lesiure time among adults in Germany. J Health Monit. 2017;2(2):35–42.
69. King WC, Belle SH, Eid GM, Dakin GF, Inabnet WB, Mitchell JE, et al. Physical activity levels of patients undergoing bariatric surgery in the Longitudinal Assessment of Bariatric Surgery (LABS) Study. Surg Obes Relat Disord. 2008;4(6):721–8.
70. Herring LY, Stevinson C, Davies MJ, Biddle SJH, Sutton C, Bowrey D, et al. Changes in physical activity behaviour and physical function after bariatric surgery: A systematic review and meta-analysis. Obes Rev. 2016;17:250–61. [PubMed: 26783103]
71. Pearl RL, Hopkins CM, Berkowitz RI, Wadden TA. Group cognitive-behavioral treatment for internalized weight stigma: A pilot study. Eat Weight Disord. 2018;23(3):357–62. [PubMed: 27787772]
72. Pearl RL, Wadden TA, Bach C, Gruber K, Leonard S, Walsh OA, et al. Effects of a cognitive-behavioral intervention targeting weight stigma: A randomized controlled trial. J Consult Clin Psychol. 2020;88(5):470–80. [PubMed: 31971410]
73. Palmeira L, Pinto-Gouveia J, Cunha M. Exploring the efficacy of an acceptance, mindfulness & compassionate-based group intervention for women struggling with their weight (Kg- Free): A randomized controlled trial. Appetite. 2017;112:107–16. [PubMed: 28119138]
74. Levin ME, Potts S, Haeger J, Lillis J. Delivering acceptance and commitment therapy for weight self-stigma through guided self-help: Results from an open pilot trial. Cog Behav Pract. 2018;25(1):87–104.
75. Puhl RM, Peterson JL, Luedicke J. Weight-based victimization: Bullying experiences of weight loss treatment-seeking youth. Pediatrics. 2013;131(1):e1–9. [PubMed: 23266918]
76. Peterson JL, Puhl RM, Luedicke J. An experimental investigation of physical education teachers' and coaches' reactions to weight-based victimization in youth. Psychol Sport Exer. 2012;13(177–185).
77. Meadows A, Higgs S. A bifactor analysis of the Weight Bias Internalization Scale: What are we really measuring? Body Image. 2020;33:137–51. [PubMed: 32155463]
78. Sabiston CM, Pila E, Vani M, Thogersen-Ntoumani C. Body image, physical activity, and sport: A scoping review. Psychol Sport Exer. 2019;42:48–57.
79. Alcaraz-Ibanez M, Paterna A, Sicilia A, Griffiths MD. A systematic review and meta- analysis on the relationship between body dissatisfaction and morbid exercise behavior. Int J Environ Res Public Health. 2021;18:585.

Study Importance Questions

What major reviews have already been published on this subject?

- Prior reviews have summarized the relationship between weight stigma and health.
- No review to date has provided a systematic investigation of the nature, quality, and findings of studies that examine links between weight stigma and physical activity.

What are the new findings of this manuscript?

- In the majority of studies, weight teasing, everyday discrimination, and internalization are associated with reduced physical activity.
- Findings are inconsistent depending on samples and measures, and most studies rely on observational, cross-sectional, and self-reported physical activity data.

How might these results change the direction of research or focus of clinical practice?

- Greater rigor of physical activity assessment and use of longitudinal designs are needed in this nascent area of research.
- Addressing weight stigma in physical activity settings could enhance engagement and result in clinical health benefits for youth and adults of all sizes.

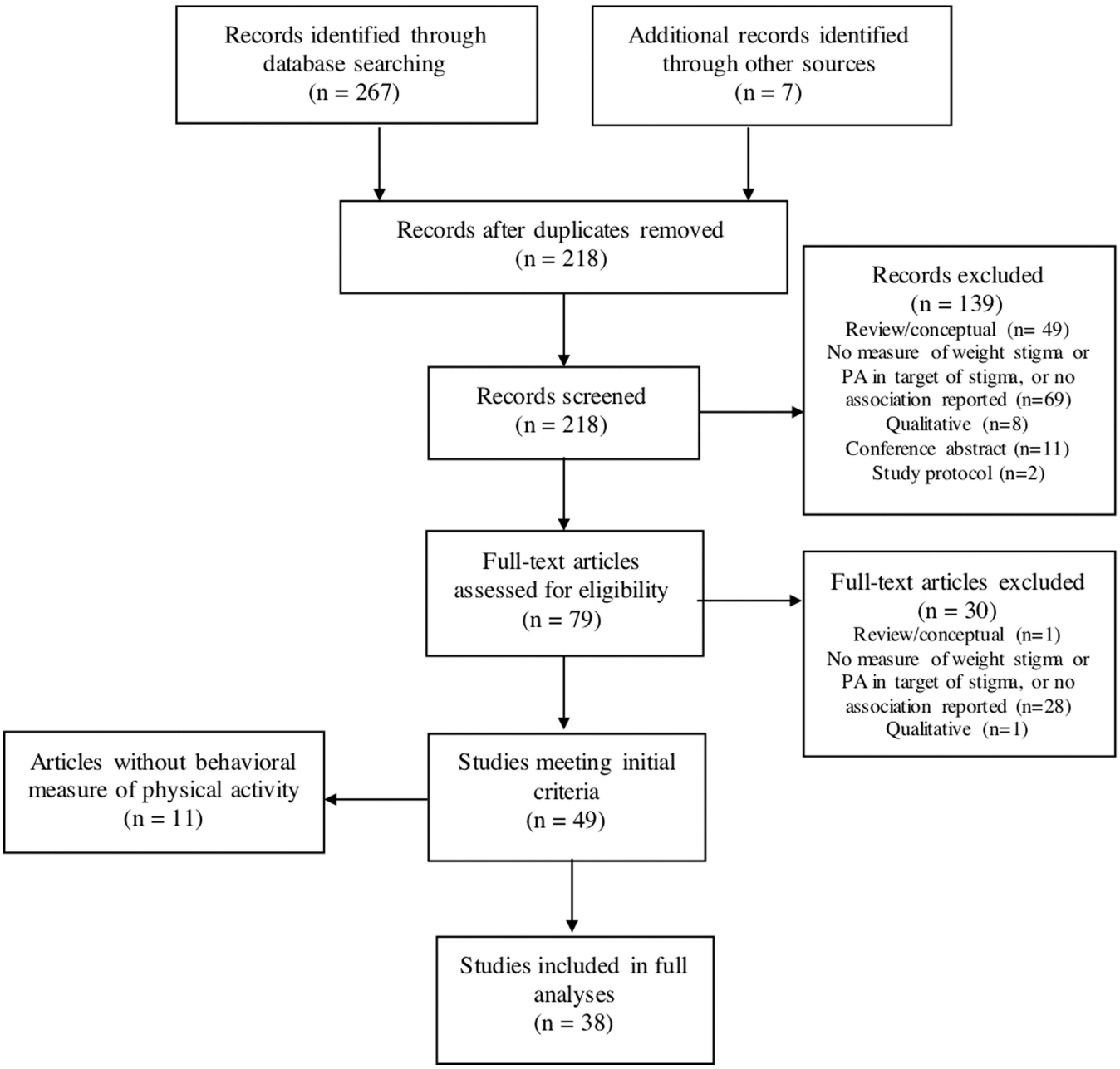

Figure 1.
Flow diagram for study selection

Table 1.

Overview of key findings from studies of weight stigma and physical activity (PA) in adults (n=29) and youth (n=9)

	Adult Studies (%)	Youth Studies (%)
Associations Between Weight Stigma and PA		
Significant Negative Association	58.6	66.7
Significant Positive Association	17.2	22.2
Non-Significant Association	69.0	66.7
Study Design		
Observational/Cross-Sectional	79.3	88.9
Observational/Longitudinal	6.9	11.1
Experimental/Longitudinal	13.8	0
PA Measures		
Self-Report	79.3	77.8
Interview Self-Report	10.3	11.1
Objective Measure	10.3	22.2

Note. Total percentages for associations between weight stigma and PA exceed 100%, because several adult and youth studies reported both significant and non-significant associations due to inclusion of multiple measures of weight stigma and PA (e.g., an association was significant for vigorous but not moderate PA). Associations include both direct and indirect statistical effects of weight stigma on PA. One adult study included in the experimental/longitudinal category used a quasi-experimental design. One youth study included both objective and self-report measures of PA.

Table 2.

Summary of published studies examining relationship between weight stigma and engagement in physical activity in adults

Author (year)	Sample	Study Design	Measure of Weight Stigma	Measure of PA	Type of PA Measure	Key Findings
Boros et al. (2017)	Community: 90 female college students	Observational, Cross-sectional	POTS	Accelerometer worn for 7 days	Objective	Participants with a history of weight teasing had fewer weekly minutes of vigorous activity (25 vs. 54 min). No relationship with moderate or overall activity. Analyses did not control for weight.
Brunson et al. (2014)	Community: 399 undergraduate students	Observational, Cross-sectional	Weight-related social control items asking frequency and sources of comments urging participants to exercise more, eat more healthy foods, or avoid unhealthy foods.	Frequency and duration of strenuous, moderate, and mild exercise in past 2 weeks (combined for total exercise score)	Self-report	Weight-related social control negatively correlated with total exercise among men (r=−0.25) and women (r=−0.13). In conditional process model, women (not men) with higher BMIs or who perceived themselves as overweight reported more weight-related social control, which was associated with less PA. Parents as the source, and friends for men (not women), were associated with less exercise. “No one” as a source associated with more exercise. No effect of number of sources on PA.
Burnette & Mazzeo (2020)	Community: 855 undergraduate students	Observational, Cross-sectional	WBIS-M	EDE-Q compensatory exercise (yes/no and frequency)	Self-report	WBIS-M associated with greater endorsement of compensatory exercise in men and women, but associated with reduced frequency of compensatory exercise in men (no relationship for women)
Carels et al. (2019)	Community: 66 adults with overweight/obesity	Observational, Cross-sectional	WBIS with additional items	Steps on Fitbit worn for 28 days; Yes/no and minutes of PA each day	Objective, Daily diary	WBIS not associated with any measure of activity within or between participants.
Carels et al. (2009)	Clinical: 46 adults with overweight/obesity enrolled in a stepped-care weight loss trial including self-help phase and group BWL phase.	Observational, Longitudinal (6- and 18-weeks)	Obese Persons Trait Survey; Weight IAT for “bad” and “lazy” (as measures of internalized stigma)	Reported daily type and duration of PA and energy expenditure, all calculated from accelerometer	Self-report of objective data	Greater negative trait endorsement and IAT-bad scores associated with less energy expenditure after 6 weeks of self-help treatment (r= −0.38 and −0.27). Greater positive trait endorsement associated with longer average duration of PA bouts (r=0.30). At the end of 18 week treatment (self-help and BWL combined), greater negative trait endorsement associated with less energy expenditure, r=−0.29.
Cheng et al. (2019)	Community: 324 Chinese college students	Observational, Cross-sectional	WBIS	IPAQ-SF (total METs in past week)	Self-report	When controlling for PA attitudes, perceived control, and norms, WBIS associated with lower reported METs (explained 8% of variance).
Feig et al. (2020)	Clinical: 112 patients post-bariatric surgery	Observational, Cross-sectional	WBIS-M	IPAQ-SF (MVPA and walking METs in past week)	Self-report	WBIS associated with less MVPA (r=−0.23), but not walking. This remained when controlling for demographics, BMI, and surgery type, and time since surgery (explained 5% of variance for MVPA). The relationship between WBIS and MVPA was mediated by less exercise self-efficacy, more exercise barriers, and more depression.
Han et al. (2018)	Clinical: 298 patients post-bariatric surgery	Observational, Cross-sectional	SSI (adapted, 29 items); WBIS (adapted, 7 items)	Number of days of no walking, no moderate, and	Self-report	No direct effect of SSI or WBIS on PA, but significant indirect effects of both mediated by motivation to avoid exercise.

Author (year)	Sample	Study Design	Measure of Weight Stigma	Measure of PA	Type of PA Measure	Key Findings
				no vigorous activity in the week		
Himmelstein et al. (2019)	Community: 1249 men from representative US panel (Sample 1); 504 diverse men (Sample 2)	Observational, Cross-sectional	WBIS-M; Yes/no for experiences of weight stigma based on 3 items	GLTEQ (total score for typical week)	Self-report	Controlling for demographics, BMI, and depression, WBIS-M negatively associated with PA in Sample 1 (beta=−0.10) but not Sample 2. No effects of stigma experiences on PA. In Sample 1, significant indirect effect of experiences on PA via WBIS-M.
Hubner et al. (2015)	Clinical: 179 bariatric surgery candidates	Observational, Cross-sectional	WBIS	IPAQ-SF (minutes of moderate PA, vigorous PA, and walking in past week)	Self-report	WBIS mediated the relationship between general self-efficacy and less moderate and vigorous PA (not walking). Did not report direct association between WBIS and PA.
Jackson & Steptoe (2017)	Community: 5480 UK adults age 50 years or older	Observational, Cross-sectional	5 items of EDS (coded yes/no to weight discrimination)	3 questions assessing frequency of light, moderate, and vigorous activity per week	Interview self-report	Controlling for age, sex, SES, and BMI, those who perceived weight discrimination had 60% greater odds of no or light activity and 30% lower odds of moderate to vigorous activity at least once per week.
Koball et al. (2018)	Clinical: 242 internal medicine patients	Observational, Cross-sectional	WBIS-M	GLTEQ (moderate-to-strenuous activity score for typical week)	Self-report	No correlation between WBIS-M and PA. Did not control for BMI.
Lambert et al. (2019)	Community: 172 women, subsample of 81 women with obesity	Experimental, Longitudinal (1-month)	Experimental manipulation (read stigmatizing news story vs. control); SSI-B	GLTEQ (total score for typical week)	Self-report	No effect of experimental manipulation or SSI-B on PA at 1-month follow-up
Mensinger & Meadows (2017)	Clinical: 80 inactive women with obesity enrolled in weight neutral or weight loss interventions	Observational, Longitudinal (6 months)	WBIS	Red Lotus Quality of Life questionnaire item assessing endorsement of participation in 30 minutes of moderate intensity activity most days	Self-report	Significant WBIS x time interaction: Participants with high WBIS did not increase moderate PA after 6 months of treatment, while those with low WBI showed significant improvements.
Myre et al. (2019)	Community: 103 Canadian women who identified as having obesity and could participate in PA	Experimental, Longitudinal (4 weeks)	Experimental manipulation (implicit retraining for reducing weight stigma in PA compared to control); WBIS-M; SSI-B	GLTEQ (MVPA METs for typical week)	Self-report	Implicit retraining that showed women with obesity in positive PA pictures, compared to PA goal-setting task control, had no effect on WBIS-M or PA. No significant correlation between WBIS-M or SSI-B and PA.
Pearl & Dovidio (2015)	Community: 804 Amazon.com Mechanical Turk participants	Observational, Cross-sectional	Yes/no for experiences of weight stigma based on 3 items	GLTEQ (total score for typical week)	Self-report	In regression model that included weight status and "just world" beliefs, weight stigma experiences not associated with PA and did not interact with weight status. Participants who had experienced weight stigma and had stronger just world beliefs reported more PA, compared to those who experienced weight stigma and had weaker just world beliefs.
Pearl, Dovidio et al. (2015)	Community: 72 women	Experimental Longitudinal (1 week)	Stigma manipulation (watched stigmatizing video vs. control); adapted SSI (average of domain	GLTEQ (total score at baseline and 1-week follow-up)	Self-report	SSI not associated with PA at baseline. No main effect of experimental condition or SSI on follow-up PA. When controlling for BMI, significant interaction of past frequency of SSI and stigma exposure: Participants who viewed stigmatizing

Author (year)	Sample	Study Design	Measure of Weight Stigma	Measure of PA	Type of PA Measure	Key Findings
			and source scores for total frequency)			video and had more frequent weight stigma reported more PA 1 week later.
Pearl, Puhl, & Dovidio (2015)	Community: 177 women with overweight/obesity	Observational, Cross-sectional	3 yes/no items of weight stigma experiences, summed (0–3); WBIS, Fat Phobia Scale; BAOP	GLTEQ (total score for typical week)	Self-report	Controlling for BMI, experiences correlated with more PA (r=0.34). No correlations of WBIS, Fat Phobia, or BAOP with PA. In regression model including BMI, experiences, and WBIS, experiences associated with more PA (beta=0.42) and WBIS associated with less PA (beta=−0.15). WBIS mediated (but did not moderate) the relationship between experiences and reduced PA.
Pearl et al. (2020) [a]	Clinical: 18,769 WW members	Observational, Cross-sectional	WBIS-M; Yes/no for experiences of weight stigma based on 3 items; Onset, frequency, distress, and interpersonal sources of weight stigma	GLTEQ (total score for typical week)	Self-report	Controlling for participant characteristics (including BMI), WBIS-M associated with less PA, but small effects (beta values 0.09–0.14 depending on covariates), so interpreted with caution. No effect of stigma experiences, onset, frequency, distress, or interpersonal sources on PA.
Phibbs et al. (2019)	Community: 19,382 adults age 50 years or over	Observational, Cross-sectional	EDS and Attributions of Everyday Discrimination question (dichotomous)	Two items asking about moderate and vigorous activity, each dichotomized as ever vs. never	Interview self-report	When controlling for BMI, demographics, and other health issues, participants who had ever experienced weight discrimination were ~20–25% less likely to report ever engaging in moderate or vigorous PA. Discrimination mediated the relationship between BMI and PA (accounted for 9–13% of variance).
Potter et al. (2015)	Clinical: 168 adults with poorly controlled type 2 diabetes	Observational, Cross-sectional	EDS, yes/no due to height/ weight	Summary of Diabetes Self-Care Activities item assessing how many days of exercise in past week	Self-report	When controlling for BMI, height, depression, demographics, and total discrimination (i.e., frequency of any form of discrimination), participants who perceived height/weight discrimination had less days of exercise (approximately 2 vs. 3 days).
Puhl et al. (2019) [a]	Clinical: 658 sexual minority WW members matched with 658 heterosexual members	Observational, Cross-sectional	WBIS-M; Yes/no for experiences of weight stigma based on 3 items	GLTEQ (total score for typical week)	Self-report	No consistent associations (and no interactions with sexual identity) between stigma experiences and PA. While some small effects of both measures were found, the p values were >.001 and thus not interpreted as significant in this large sample.
Puhl et al. (2017)	Community: 2702 US adults from online panel who had intentional weight reduction of 10% or more as of one year ago	Observational, Cross-sectional	WBIS-M; 3 yes/no items of weight stigma experiences, summed (0–3)	GLTEQ (total score for typical week)	Self-report	Controlling for demographics and BMI one year ago, WBIS-M, but not experiences, negatively correlated with GLTEQ (r=0.14 and 0.16 for participants who reported maintaining vs. regaining lost weight).
Sattler et al. (2018)	Clinical: 439 adults with overweight/obesity enrolled in weight loss study	Observational, Cross-sectional	SSI-B	IPAQ-SF (minutes of moderate PA, vigorous PA, and walking in past week)	Self-report	When controlling for gender, BMI, and exercise motivation, no direct association between weight stigma experiences and PA. In mediation models, men had a conditional direct effect of higher rates of stigma associated with more walking and vigorous PA; women had an indirect effect of higher rates of stigma associated with less autonomous exercise motivation, which was associated with less walking, moderate, and vigorous PA.

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Author (year)	Sample	Study Design	Measure of Weight Stigma	Measure of PA	Type of PA Measure	Key Findings
Schvey et al. (2017)	Community: 389 adults with overweight/obesity	Observational, Cross-sectional	WBIS-M; Shortened version of Coping with Weight Stigma Questionnaire; Gym Survey created for the study, including Stigma at the Gym subscale; Gym Preferences (assessing factors such as shame-free environment and specialization for members with overweight that affect gym choices)	Frequency of gym attendance	Self-report	Gym attendance frequency not associated with any stigma measure.
Udo et al. (2017)	Community: 21,357 adults with overweight/ obesity from US national survey	Observational, Cross-sectional	5 items of EDS (yes/no due to weight)	Frequency of moderate or rigorous activity (less than twice per year, 3–12 times per year, 2–4 times per month, 2–4 times per week, every day)	Interview self-report	Participants who reported weight discrimination had more frequent physical activity in full sample. Gender stratification showed this relationship only among women and not men.
Vartanian & Novak (2011)	Community;111 adults with overweight	Observational, Cross-sectional	SSI	Modified GLTEQ (minutes of mild, moderate, and strenuous PA)	Self-report	SSI not correlated with mild, moderate, or strenuous PA.
Vartanian & Shaprow (2008)	Community: 100 female undergraduates	Observational, Cross-sectional	SSI	Score combining frequency and duration of mild, moderate, and strenuous PA	Self-report	SSI not associated with mild, moderate, or strenuous activity in full sample or when divided into overweight vs. non-overweight.
Watkins et al. (2014)	Clinical: 51 middle aged white women with overweight/obesity, divided into intervention group (13) and quasi-control group (38)	Quasi-experimental, Longitudinal (3 months)	Quasi-experimental condition: Fitness program aimed at reducing weight bias and promoting body acceptance in fitness settings, compared to women not in program and exercising at low or moderate levels	GLTEQ (total score for typical week)	Self-report	No significant group x time interaction, meaning no significant between-group differences in change in PA over 3 months.

Note. BAOP=Beliefs about Obese Persons; BMI=Body Mass Index; EDE-Q=Eating Disorders Examination-Questionnaire; EDS=Everyday Discrimination Scale; GLTEQ=Godin Leisure-Time Exercise Questionnaire; IAT=Implicit Association Test; IPAQ(-SF)=International Physical Activity Questionnaire-Short Form; MET=metabolic equivalent; MVPA=moderate-to-vigorous physical activity; PA=physical activity; POTS=Perceptions of Teasing Scale; SSI(-B)=Stigmatizing Situations Inventory(-Brief); WBIS(-M)=Weight Bias Internalization Scale (Modified); WW=formerly Weight Watchers.

[a]These studies included participants from the same larger sample.

Table 3.

Summary of published studies examining relationship between weight stigma and engagement in physical activity in youth

Author (year)	Sample	Study Design	Measure of Weight Stigma	Measure of PA	Type of PA Measure	Key Findings
Faith et al. (2002)	Community: 576 5th through 8th graders	Observational, Cross-sectional	POTS; Weight Criticism During Physical Activity Scale (WCA); Children's Coping Strategies Checklist-Revision 1 adapted for weight criticism	Godin-Shepard Physical Activity survey (METs for mild, moderate, and strenuous activity)	Self-report	POTS associated with more mild PA (beta=0.12). WCA associated with less mild PA (beta=−0.31) and moderated by problem-focused coping in response to weight criticism. No effects of POTS or WCA on moderate or strenuous PA.
Greenleaf et al. (2014)	Community: 1419 middle school students	Observational, Cross-sectional	Yes/no items assessing if ever been teased for weighing too much by family, male friends, or female friends	Number of days in past week of 30–60 min aerobic activity, strengthening, and stretching/flexibility; 2 items from Youth Risk Behavioral Survey for sedentary behavior (number of hours watching TV and playing video games or on computer); FITNESSGRAM test battery for physical fitness (progressive aerobic cardiovascular endurance run [PACER] of 20-m laps, number of curlups and pushups, sit and reach test	Objective measure of physical fitness, Self-report	Controlling for BMI, SES, ethnicity, gender, and pubertal development, participants who were teased had lower PACER scores and fewer pushups (Cohen's d = 0.58 and 0.53). No effects on curl ups or sit and reach were found. No effect of teasing on self-reported PA or sedentary behavior.
Hand et al. (2017)	Community: 302 9th through 12th graders	Observational, Cross-sectional	Weight IAT	Youth Risk Behavior Survey items: Days per week of activity 60 minutes or more, screen time in hours per day	Self-report	IAT not associated with either PA measure. Tested pathway from characteristics (e.g., BMI) → IAT → perceived stress and maladaptive coping → PA: model not significant.
Jensen et al. (2014)	Community: 108 4th and 5th graders	Observational, Longitudinal (1 year)	Teasing During Physical Activity questionnaire (6 items from WCA scale), though not specific to weight teasing	Fels Physical Activity Questionnaire	Self-report	Path analysis found that for children with overweight, teasing and PA at time 2 were negatively correlated (r=−0.32). Teasing at time 1 did not predict PA at time 2. Teasing at T1 also not correlated with PA at Time 1.
Losekam et al. (2010)	Community: 321 5th through 8th graders	Observational, Cross-sectional	POTS	Leipzig Lifestyle Questionnaire for Adolescents, including a physical activity subscale for frequency	Self-report	Weight teasing not correlated with PA. Regression model controlling for demographics, BMI, self-efficacy, and parental exercise showed weight teasing associated with less PA in boys (beta=−0.20) but not girls.
Storch et al. (2007)	Clinical: 92 children 8–18 years old in the 85th-95th BMI percentile, in lipid clinic	Observational, Cross-sectional	Schwartz Peer Victimization Scale (not specific to weight teasing)	PACE+ Adolescent Physical Activity measure (2 items assessing how many days active for at least 60 min in the past week and in a typical week)	Self-report	Peer victimization negatively correlated with PA (r=−.32). Mediation analyses showed direct and indirect effects of victimization on PA through depression (though not anxiety or social physique anxiety). Loneliness also fully mediated path from victimization to reduced PA.
Sutin et al. (2020)	Community: 2995 Australian adolescents in national panel	Observational, Cross-sectional	Single yes/no item of body discrimination	Branched Eating Disorders Test item assessing yes/no exercised to control weight	Self-report	Controlling for depression and general peer victimization, participants who reported body-related discrimination in the past 6 months (vs.

Author (year)	Sample	Study Design	Measure of Weight Stigma	Measure of PA	Type of PA Measure	Key Findings
						those who did not) had 37% greater odds of reporting that they exercised for weight control.
Valois et al. (2019)	Clinical: 209 adolescents in weight management program	Observational, Cross-sectional	Social Life subscale of the Impact of Weight on Quality of Life for Kids (includes teasing); Weight Esteem subscale of Body Esteem Scale for Adolescents and Adults	Interview by exercise specialist to determine participation in physical activity (yes/no)	Interview self-report	Controlling for demographics and weight status, participants who participated in extracurricular PA had better weight-related social life ratings (i.e., less teasing). Better weight-related social life mediated the relationship between participation in PA and weight esteem.
Watanabe et al. (2017)	Community: 95 12–14 year-old students	Observational, Cross-sectional	POTS (continuous to reflect frequency and distress); Perceptions of Weight Teasing During Physical Activity (adapted from WCA)	Accelerometry for 1 week, minutes of MVPA as well as light, moderate, and vigorous PA.	Objective	No association between either teasing variable and any level of PA (no covariates included).

Note. BMI=Body Mass Index; MET=metabolic equivalent; MVPA=moderate-to-vigorous physical activity; PA=physical activity; POTS=Perceptions of Teasing Scale; WCA=Weight Criticism During Physical Activity Scale