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The Influence of Maternal Body-Shaming Comments and Bodily Shame on Portion Size

Savannah R. Flak
University of South Florida

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by

Savannah R. Flak

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Major Professor: Wendy M. Rote, Ph.D.
Lindsey Rodriguez, Ph.D.
Diana Rancourt, Ph.D.

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Abstract

Young adult women are more likely to be dissatisfied with their bodies (Wansink et al., 2017) and engage in disordered eating patterns when they have a history of receiving parental comments about their bodies during childhood (Fortesa & Ajete, 2014). Furthermore, high bodily shame mediates the relationship between receiving critical messages about eating from parents during childhood and disordered eating behaviors for young adult women (Oliveira et al., 2019). Altogether, this suggests that bodily shame is a distinct pathway linking parental influence during adolescence to eating disturbances. However, little research has examined the unique roles that bodily shame, internalized weight bias, and body satisfaction play in young women's eating behaviors. Therefore, the current study sought to clarify the mechanism (e.g., increased bodily shame) through which recalling hurtful maternal comments about one's weight affects portion sizes for young adult women. The impact of body mass index (BMI) was also explored.

Participants were 328 female college students (M_{age} = 19.45, *SD* = 1.57) with relatively diverse body sizes (M_{BMI} = 25.10, *SD* = 5.45) from a southern U.S. university. After reporting levels of mood, hunger level, perceived body shape, and internalizing symptoms, participants were randomly assigned to one of two conditions. The shame condition had participants recall a memory from their adolescence in which their mother body shamed them for being too big while the neutral condition had participants recall a memory where their mother talked to them about something boring. Participants then reported their current levels of internal bodily shame, external bodily shame, internalized weight bias, and body satisfaction. Portion size was

measured by presenting images of systematically different portion sizes for various foods (i.e., pasta, curry, chips, cake, and oatmeal) and having participants indicate the portion they would choose to eat. In addition, participants reported how much they enjoy each food as well as their history of receiving maternal body influence and their tendency to engage in disordered eating behaviors.

A parallel mediation model showed no relationship between recalling maternal body-shaming comments and any variables of interest. However, both internal bodily shame and internalized weight bias were associated with smaller portion size choice. Moderated mediation models demonstrated that BMI moderated these associations. In particular, higher internalized weight bias only significantly predicted choosing smaller portions for those with BMIs of approximately 27.9 and lower. More notably, higher internal bodily shame was significantly linked to choosing smaller portions for those with BMIs of approximately 24.0 and lower while it was linked to choosing larger portions for those with BMIs of approximately 34.8 and higher. This dual effect of internal bodily shame on portion size choice suggests that associations between bodily shame and eating behavior is more complex than previously identified. More specifically, bodily shame appears to have different effects on eating behaviors depending on a young woman's body size. Future research should better disentangle these distinct pathways and how they are linked to disordered eating behaviors such as dietary restraint.

Introduction

The sociocultural model of eating disturbances among young women in Western cultures posits that disordered eating results from the pressure women receive from Western society (i.e., family, peers, and the media) to achieve an idealized slender figure and avoid obesity (e.g.,Twamley & Davis, 1999). According to this model, the internalization of pressures to be thin can result in disordered eating behaviors and pathology when body dissatisfaction is high, or when there is a disconnect between one's perception of their actual and idealized body size (Thompson et al., 1999). Self-discrepancy theory asserts that individuals compare perceptions of their actual self to their idealized self, derived both from their own ideal and from their perception of who others believe they ought to be (Higgins, 1987). Since individuals strive to minimize any discrepancy between their actual and idealized perceived selves, those with larger discrepancies experience greater negative emotional states that increase emotional distress. In turn, the negative emotional states resulting from body dissatisfaction are believed to be driving forces behind obesity and disordered eating behaviors (e.g., Stice & Shaw, 2002).

The thin ideal can be communicated and internalized through exposure to weight bias, or negative attitudes and beliefs towards individuals who are overweight or obese that often result in prejudice and discrimination (Puhl & Latner, 2007). Over time, weight bias can become internalized in the form of a self-stigmatization in which negative weight stereotypes about oneself are believed. In turn, this internalized weight bias has been linked to increased psychological distress (i.e., depression and anxiety; Alimoradi et al., 2020) as well as disordered eating for individuals who are overweight and non-overweight (e.g., Pearl & Puhl, 2014; Schvey

et al., 2013; Schvey & White, 2015). Altogether, the existing literature suggests that sociocultural pressures, weight stigma, internalized weight bias, body dissatisfaction, and negative affect are all potential driving forces of disordered eating. Therefore, a main goal of the current study is to better clarify the mechanisms that link body dissatisfaction, internalized weight bias, and negative emotions to disordered eating behaviors.

Negative Emotions and Disordered Eating

The Cyclic Obesity/Weight-Based Stigma Model (COBWEBS; Tomiyama, 2014) proposes that experiencing weight stigma leads to stress responses as well as other cognitive and emotional reactions that subsequently lead to increased emotional eating, placing individuals at risk of further weight stigmatization (Tomiyama, 2014). Various evidence supports this model, including that experiencing weight stigma predicts greater disordered eating (i.e., emotional and uncontrolled eating) due to psychological distress and weight bias internalization for individuals who are overweight and non-overweight (e.g., O'Brien et al., 2016). Furthermore, the sociocultural pressure and stigmatizing experience of weight teasing has been found to have a significant direct effect on disordered eating as well as an indirect effect through psychological distress (Gan et al., 2011).

The COBWEBS model is consistent with the negative affect regulation pathway of the dual pathway model of bulimic behavior, which argues that dysfunctional overeating patterns can be a form of affect regulation in which individuals cope with the negative emotions that result from experiences of body dissatisfaction and sociocultural pressures to be thin (e.g., Holmes et al., 2015; Stice, 2001; Stice & Shaw, 2002). This pathway in the model is supported by correlational evidence that higher levels of reported negative affect and emotional eating tendencies were associated with eating more in a taste test (e.g., Ouwens et al., 2009) as well as

experimental evidence that recalling experiences of feeling deep general shame also was associated with eating more in a taste test (Chao et al., 2012). This suggests that overeating behaviors may result from a lack of effective emotional regulation and begs the question of whether particular negative emotions such as bodily shame, or feeling flawed and inadequate because of your body, play a significant role in the path from experiencing sociocultural pressures and weight stigma to overeating. Therefore, the current study attempts to specifically link bodily shame, along with body dissatisfaction and internalized weight bias, to overeating behaviors.

The Specific Role of Bodily Shame

While the COBWEBS and dual pathway models do not specifically focus on bodily shame as a form of psychological distress or negative affect, it is crucial to better clarify the distinct effect of bodily shame on disordered eating. For instance, not only does evidence suggest that bodily shame is related to eating disturbances for both clinical and non-clinical adult populations (Doran & Lewis, 2012; Duarte et al., 2014; Oliveira et al., 2019), but there is also evidence that bodily shame is the strongest predictor of eating disturbances in adolescents, especially for girls (Mustapic et al., 2017). In fact, those who experience more bodily shame tend to eat more over the course of a week (Troop, 2016). Furthermore, research indicates that the relationship between general shame and eating pathology is fully dependent on bodily shame (Duarte et al., 2015), suggesting that bodily shame in particular is central to the relationship between experiences or thoughts eliciting shame and disordered eating behaviors.

The weight stigma and well-being process model places bodily shame as a central process through which experiences of weight stigma and internalized weight bias negatively affect psychological well-being and health outcomes (Tylka et al., 2014). This model was

designed based on evidence that weight stigma and perceived weight discrimination are associated with outcomes such as increased risk of developing mental and substance abuse disorders for adults of all weight statuses (Hatzenbuehler et al., 2009), binge eating in college students (e.g., Almeida et al., 2011), and unhealthy weight control behaviors in adolescents (e.g., Neumark-Sztainer et al., 2002). In addition, this model is consistent with recent correlational evidence that the relationship between internalized weight bias and binge eating is strongly mediated by bodily shame (Mehak et al., 2018), emphasizing the importance of specifically studying bodily shame and overeating in the context of experiencing sociocultural pressures to be thin as well as internalized weight bias.

A more comprehensive model has recently been proposed focusing specifically on how body satisfaction, internalized weight bias, and bodily shame explain the relationships among the experiences of sociocultural pressures and stigma and various negative outcomes, including binge eating (Lee et al., 2019). Evidence suggests that experiences of sociocultural pressures to be thin and weight stigma are related to lower body satisfaction as well as higher internalized weight bias and bodily shame, which in turn are related to increased binge eating (Lee et al., 2019). However, some of these associations were found to be moderated by BMI; for instance, the positive relationships between sociocultural pressures and internalized weight bias, as well as bodily shame and binge eating, were especially true for individuals with higher BMIs. On the other hand, the negative relationships between sociocultural pressures and body satisfaction, as well as body satisfaction and binge eating, were especially true for those with smaller BMIs.

These results provide evidence supporting the notion that binge eating is often a coping strategy used to regulate negative affect, potentially due to body dissatisfaction or perceiving one's body as being large. Bodily shame more specifically appears to be an important negative

emotion that impacts binge eating above and beyond general negative affect (Duarte et al., 2014, 2017). However, the distinct contributions of body dissatisfaction, internalized weight bias, and bodily shame to overeating behaviors more generally are not clear, especially within the context of specific types of sociocultural pressures. Therefore, another main goal of the current study is to link sociocultural pressures originating more specifically from the familial context and the potential effects this has on eating behaviors due to bodily shame, internalized weight bias, and body satisfaction.

Familial Influence on Disordered Eating

The sociocultural pressure and stigmatizing experience of receiving negative comments about one's body has gained attention in the literature, where emerging evidence suggests that comments from family members play an important role in the development of disordered eating (e.g., Gillison et al., 2016). Research indicates that a history of parental comments about one's body during childhood predicts body dissatisfaction (Wansink et al., 2017) and disordered eating in young adult women, even when the comments were given with positive intentions such as encouragement for weight control (Fortesa & Ajete, 2014). In fact, a meta-analysis found that parental comments about weight control as encouragement for losing weight, as well as being criticized about your weight during childhood, both strongly predict disordered eating behaviors (Gillison et al., 2016). In addition, high bodily shame in adult women mediates the relationship between receiving critical messages specifically about eating from parents during childhood and disordered eating in adulthood (Oliveira et al., 2019). Altogether, this indicates that sociocultural pressures to be thin and weight stigmatizing experiences from parents may be distinct and important pathways through which eating disturbances develop.

This parental influence pathway is concerning considering that family weight talk and teasing appear to be quite common in the United States. For instance, in a study of 581 parents of preadolescents or adolescents, 43.6% reported engaging in regular talk about their child's body in front of them (Lydecker et al., 2018). In addition, a study of 1257 young adult women revealed that 35.9% reported receiving hurtful comments about their weight as an adult by family members (Eisenberg et al., 2011b). Not only are these hurtful comments from family members relatively common for young adult women, but they also predict disordered eating after controlling for previous disordered eating behaviors as well as having a history of receiving hurtful comments (Eisenberg et al., 2012).

Together, these findings highlight the importance of clarifying the mechanism (e.g., increased bodily shame) through which hurtful parental comments about one's weight lead to the development of disordered eating for young adults. Mothers' comments, in particular, may be important in these processes since adolescents report receiving more weight-related comments from mothers compared to fathers (Puhl & Himmelstein, 2018). Moreover, more frequent discussions regarding weight between mothers and daughters are associated with the daughter being at a higher risk of developing eating pathology (Berge et al., 2013; Chow & Tan, 2018). Due to these findings, the current study focuses specifically on the impact that recalling maternal body-shaming comments during adolescence has on the current eating behaviors of young adult women.

College Student Population

According to the DSM-5, eating disorders (ED) are characterized by persistent and severe disturbances in eating behaviors and related thoughts that cause psychological and/or physical dysfunction (American Psychiatric Association, 2013). Despite a relatively low rate of diagnosed

EDs in the general college population (4% of females and 0.2% of males; Eisenberg et al., 2011a), many students are at a high risk of developing an ED (17% of females and 5% of males) due to dietary restraint as well as eating and weight concerns (Lipson & Sonneville, 2017). The college population in particular is at a high risk due to the median age of ED onset (i.e., 18-21 years old; Hudson et al., 2007) coinciding with the traditional undergraduate years, even though symptoms often start emerging earlier during adolescence (Swanson et al., 2011).

Many young adults who do not meet the criteria for a diagnosis of an ED still engage in high-risk disordered eating behaviors (Quick & Byrd-Bredbenner, 2013), such as binge eating (i.e., uncontrollably eating unusually large amounts of food at a fast pace during a specific period of time), restrained eating (i.e., restricting food intake due to weight concerns while ignoring physiological cues), and inappropriate compensatory behaviors (i.e., purging and excessive exercise). In fact, about 40% of college students reported binge eating while 30% reported engaging in compensatory behaviors (Lipson & Sonneville, 2017). This is problematic since young women with more disordered eating behaviors report lower mental and physical well-being 20 years later (Wade et al., 2012).

Additionally, a high prevalence of body image dissatisfaction among college students (68% of females and 35% of males; Forrest & Stuhldreher, 2007) further places this population at risk of developing an ED (Stice, 2002). Indeed, college students tend to idealize a body weight (i.e., body-mass index [BMI]) that does not meet the standards for a healthy body weight (Neighbors & Sobal, 2007). This further emphasizes how the college population is at a particularly high risk of adopting disordered eating behaviors. Together, these studies highlight the importance of better understanding the underlying mechanisms of disordered eating in the college population, particularly among female college students.

Gaps in the Literature

While all of the models previously discussed are important steps toward better understanding the relationships among sociocultural pressures, weight stigma, negative affect, and disordered eating, there are still key gaps in the literature that need to be addressed. Correlational methods have provided strong evidence for the role of negative affect as a mediator in the relationships that sociocultural pressures and weight stigma have with overeating behaviors, but experimental studies have not yet found consistent evidence to support this (reviewed in Vartanian & Porter, 2016). A potential explanation for this inconsistency is that most experimental studies assessing mediation have focused on broad measures of negative affect, but shame (Gupta et al., 2008), and bodily shame in particular (Duarte et al., 2015), is more strongly associated with disordered eating than negative affect more broadly. As of now, studies investigating the link specifically between bodily shame and eating behaviors have utilized correlational methods that cannot demonstrate causality (e.g., Duarte & Pinto-Gouveia, 2017; Lee et al., 2019; Oliveira et al., 2019). Therefore, bodily shame has not yet been examined experimentally as a mediator of the relationship between sociocultural pressures, weight stigma, and overeating behaviors despite correlational methods indicating that bodily shame plays an important role in this relationship (e.g., Lee et al., 2019). In addition, due to a lack of experimental work, research has rarely experimentally compared processes (e.g., weight bias internalization, body dissatisfaction, and high bodily shame) through which specific sociocultural pressures and stigmatizing experiences may result in disordered eating. Ultimately, it is unclear whether these experiences impact eating behaviors through changes in weight bias internalization, body satisfaction, and bodily shame.

Furthermore, while shame more generally has been conceptualized into internal and external shame, less of a distinction has been made in the literature for bodily shame. Broadly, internal shame involves negative self-evaluations that are related to self-criticism, such as being inadequate or inferior, whereas external shame involves perceiving that others evaluate you as being inadequate or inferior (Gilbert, 1998) In previous literature, internal shame has been more closely linked to bulimic symptomology (Troop et al., 2008) and binge eating disorder (BED) (Jambekar et al., 2003) while external shame has been more closely linked to anorexic symptomology. However, external shame predicts more severe binge eating symptoms for those with BED (Duarte & Pinto-Gouveia, 2017), indicating that those engaging in more binge eating are more likely to feel that others look down on them. In addition, recent evidence suggests that both internal and external shame relate to binge eating, where this relationship is mediated by bodily shame (Melo et al., 2019). This suggests that more focus should be placed on examining potential unique effects of internal and external bodily shame. Therefore, since the potential differential impact of internal versus external bodily shame on disordered eating has not been addressed experimentally, this distinction of internal versus external bodily shame will be made and openly explored in this study.

Finally, much of the research experimentally examining the relationships among weight stigma, sociocultural pressures to be thin, and eating behaviors has focused on either priming negative weight stereotypes (e.g., Brochu & Dovidio, 2014) or exposing participants to general weight-stigmatizing content (e.g., reading an article about managers being reluctant to hire individuals who are overweight; Major et al., 2014). Therefore, only general measures of weight stigma and sociocultural pressures that do not properly capture the specificity of context, such as coming from family or peers, have been used to examined a model linking bodily shame and

binge eating (e.g., Lee et al., 2019). However, as detailed previously, family members serve as a key role in the development of disordered eating, but their unique influence has not been specifically examined in such models or experimentally. The current study therefore seeks to address this gap in the literature by focusing on the recall of hurtful weight-related comments specifically coming from mothers as a way of representing the experience of sociocultural pressure and what could be considered a stigmatizing experience to some. A portion selection task will be administered to participants after recalling either hurtful body-shaming comments or neutral comments from mothers in order to better understand the impact of this particular sociocultural pressure on eating behaviors. Since previous research has found that recalling experiences of feeling deep general shame led participants to eat more in a taste test (Chao et al., 2012), it is reasonable to propose that recalling experiences of bodily shame due to maternal comments may also have this effect.

Current Study

The aim of the current study is to experimentally investigate the extent to which internalized weight bias, body satisfaction, as well as internal and external bodily shame mediate the relationship between recalling an experience of receiving hurtful body-shaming comments from mothers and portion size in a sample of female college students. Because inducing feelings of general shame from recalled emotional memories caused participants to eat larger portions (Chao et al., 2012), and adolescents report receiving more weight-related comments from their mothers than their fathers (Puhl & Himmelstein, 2018), it is hypothesized that recalling hurtful maternal body-shaming comments will lead participants to choose larger portions in a hypothetical portion size selection task. Furthermore, since internalized weight bias is associated with binge eating for individuals who are overweight and non-overweight (e.g., Lee et al., 2019;

Pearl & Puhl, 2014; Schvey et al., 2013; Schvey & White, 2015), it is expected that a) high weight bias internalization will mediate the relationship between recalling a hurtful maternal body-shaming comment and choosing larger portions. Because experiencing weight stigma is related to body dissatisfaction (Annis et al., 2004; Myers & Rosen, 1999) and binge eating (reviewed in Puhl & Suh, 2015), as well as body dissatisfaction being highly related to binge eating symptoms (Duarte et al., 2014, 2017), it is expected that b) low body satisfaction will mediate the relationship between recalling a hurtful maternal body-shaming comment and choosing larger portions. Furthermore, since current bodily shame is found to be highly correlated with binge eating (Lee et al., 2019), and those who experience more bodily shame tend to eat more over the course of a week (Troop, 2016), it is expected that c) high internal bodily shame and d) high external bodily shame will mediate the relationship between recalling a hurtful maternal body-shaming comment and choosing larger portions. Finally, because BMI was found to moderate certain relationships among sociocultural pressures, body satisfaction, internalized weight bias, bodily shame, and binge eating (Lee et al., 2019), it is expected that participants with higher BMIs will experience a stronger relationship between bodily shame and binge eating while participants with lower BMIs will experience a stronger relationship linking low body satisfaction to binge eating. It will be openly explored whether BMI moderates any other relationships in the model.

A parallel mediation model (see Figure 1a) will be used to directly compare the unique effects of these potential mediators on portion size. However, as internalized weight bias, bodily satisfaction, and bodily shame are correlated constructs (e.g., Lee et al., 2019), each mediator will also be examined in an individual model as a form of sensitivity analysis. This process will provide evidence of whether a) internalized weight bias, b) body satisfaction, c) internal bodily

shame, and d) external bodily shame individually mediate the relationship between recalling an experience of receiving hurtful maternal body-shaming comments and portion size when not controlling for the other mediators. It is expected that each mediator will have a significant indirect effect when examined individually, but bodily shame is expected to be most predictive of choosing larger portion sizes in the combined parallel mediation model due to correlational evidence that bodily shame partially mediates the relationship between internalized weight bias and binge eating (Mehak et al., 2018).

Method

Participants

Power Analysis. Cohen (1992) proposed that experiments should attempt to achieve a power to detect significant effects of .80. While the specific links in this study have not yet been examined, Lee et al. (2019) generally found small and medium effect sizes for relationships among sociocultural pressures more generally, bodily shame, internalized weight bias, body satisfaction, and binge eating. A power analysis conducted in MedPower (Kenny, 2018) demonstrated that a sample size of at least 163 participants was necessary to yield 80% power to detect an indirect effect when the mediational paths contributing to that effect each had effect sizes of .25. Furthermore, a power analysis conducted in G*Power (Faul et al., 2009) demonstrated that a sample size of at least 81 participants was necessary to yield 80% power to detect interactions paths with effect sizes of .10. To ensure adequate power, 495 students from a public university were recruited to participate in the current study.

Participants were required to be self-identified female college students between the ages of 18 and 26 who maintain at least occasional contact with mothers. This age range was chosen for the sample not only because this range is close to the median age of onset for eating disorders (Hudson et al., 2007) but also to ensure that the maternal comments in the visualization task were applicable and to improve the likelihood that participants would be able to accurately report the frequency of maternal comments from their adolescence (i.e., ages 12-18). In addition to needing a computer or smart device with access to the Internet, participants had to have an account for

the Psychology Department's SONA research participant pool in order to sign up for and access the survey.

Participants were excluded if they did not complete the entire survey, did not successfully pass two out of three attention checks, or if they did not follow the minimum guidelines for the directed recollection task (see below for specific details). This resulted in excluding 167 participants, with a total of 328 participants (M_{age} = 19.45, *SD* = 1.57) retained for analyses. The body mass index (BMI) of included participants ranged from 17.00 to 46.45 with a mean of 25.10 (*SD* = 5.45), which is just above the lower threshold for the overweight status (25.0; Centers for Disease Control and Prevention, 2021. The final shame condition consisted of 172 participants with BMIs that ranged from 17.97 to 46.45 with a mean of 25.76 (*SD* = 5.61) while the final neutral condition consisted of 156 participants with BMIs that ranged from 17.00 to 41.80 with a mean of 24.36 (*SD* = 5.18).

Procedures

This study utilized an online consent form with a waiver of documentation of consent and an anonymous survey on Qualtrics, and participants were recruited through SONA. The survey consisted of approximately 180 questions along with a directed recollection task and a portion size selection task (see Table 1 for the order of tasks and measures).

After providing informed consent online, participants reported their mood, current hunger level, when they last ate, their perceived body shape, and their internalizing symptoms. Then, participants were randomly assigned to one of two maternal comment conditions for the directed recollection task (body-shaming or neutral). Participants were oversampled into the shame condition due to the higher chance that they could fail to accurately complete the task and therefore be excluded from analyses compared to the neutral condition. Following this task,

participants completed scales assessing internal and external bodily shame, body satisfaction, and weight bias internalization. Participants then completed the portion size selection task, followed by scales assessing disordered eating behaviors and maternal influence on body image and eating, along with demographic information including height and weight. Participants were compensated with 1 SONA point for completing the survey, which took the average participant approximately 26 minutes to complete.

Manipulation

Maternal Body-Shaming Comments - Directed Recollection Task. The emotional-event recollection technique (Leith & Baumeister, 1996) was used to induce feelings of bodily shame. This technique requires participants to recall and relive an event from the past and has been used as an affect manipulation to successfully induce feelings of shame from an emotional memory (Yang et al., 2010). Importantly, it has specifically been used to demonstrate that inducing shame from a generally shameful memory is associated with participants eating larger amounts of food (Chao et al., 2012). In the current study, a directed recollection task was used to facilitate recollection of an event of maternal body shaming (see Appendix B). Previous experimental research suggests that recalling an instance of feeling bad about one's body leads to worse emotional outcomes compared to recalling an experience of being treated unfairly due to one's weight (Pearl & Puhl, 2014). Therefore, participants in the current study recalled maternal body-shaming comments that made them feel bad about their body rather than comments that just indicate mistreatment in order to maximize the effect of this affect manipulation.

During this task, participants were instructed to recall a memory from the last 10 years about their primary female caregiver and were randomly assigned to one of two conditions; the first consisted of recalling bodily shaming comments, in which the female caregiver criticized

the participant's weight (e.g., It looks like you've been putting on the pounds. You should start eating healthier and working out more often). If participants never had that particular experience, they were instructed to write about an experience in which another female relative or other important female person in their life made a similar comment and were excluded from analyses. The second condition consisted of recalling neutral comments from their primary female caregiver (e.g., I was driving to the store today and saw that gas prices went down a few cents. Have you noticed that in your area?). All participants were instructed to replay the memory in their head for about a minute and describe it in writing in 3 to 4 sentences. Semi-guiding questions were posed (i.e., "What did she say and why? How did you feel then?") to direct the participants to relive the memory. Participants in the shame condition then indicated how bad this comment made them feel and how often they typically experienced these types of comments during adolescence and currently in their lives. This task was pilot tested prior to data collection to ensure the bodily shame condition successfully evoked feelings of bodily shame in participants. Among 10 participants, the difference in reported levels of internal bodily shame between those in the shame condition (M = 2.28, SD = 1.11) and the neutral condition (M = 1.24, SD = 0.36) was approaching significance, $t(8) = -1.99$, $p = .081$, suggesting that the manipulation was successful.

Measures

Outcome Variable

Portion Size Selection Task. A food portion choice task, similar to one developed by Hogenkamp et al. (2013) that was based on Brunstrom et al. (2008), was utilized to measure portion size using the "method of adjustment". In this 10-item task, pictures of 5 common foods (i.e., pasta, curry, chips, oatmeal, and cake) are displayed with varying portion sizes. To control

for individual differences, participants were first asked to indicate how much they enjoy eating the displayed food on a scale from 1 (*not at all*) to 5 (*very much*). Then, participants were instructed to choose the portion size that they would eat from 27 images displaying systematically different portion sizes from small to large, which were obtained from Haynes et al. (2019). The order of the 5 foods were randomized across participants. The mean portion size was calculated using responses to all food items, where an average portion size of 7 indicates the recommended portion size for that food. A similar computer-based portion size task has been validated against actual selection and consumption of food (Wilkinson et al., 2012).

Mediators

Internal Bodily Shame. The 5-item shame subscale of an adapted version of the State Shame and Guilt Scale (SSGS; Marschall et al., 1994) was used to measure participants' feelings of shame toward their bodies following the directed recollection task. This scale was originally developed to measure current feelings of guilt and shame and was adapted to measure current feelings of internal bodily shame (see Appendix C). Items (e.g., I feel humiliated and disgraced because of my body) are rated on a scale from 1 (*not at all*) to 5 (*a great deal*). This scale demonstrated good reliability, $\alpha = .934$.

External Bodily Shame. An adapted version of the modified 8-item Other As Shamer Scale (OAS2; Matos et al., 2015) was used to measure participants' perception that others look down on their body. This scale was originally developed as a shortened version of the OAS used to measure general external shame, and it was adapted to measure current feelings of external bodily shame (see Appendix D). Items (e.g., other people see me as somehow defective as a person because of my body) are rated on a scale from 0 (*not at all*) to 4 (*very much so*). This scale also demonstrated good reliability, $\alpha = .943$.

Internalized Weight Bias. The extent to which participants internalize weight bias was measured using the 11-item Modified Weight Bias Internalization Scale (WBIS-M; Pearl & Puhl, 2014) This validated scale can be used with participants of all body weight statuses. Items (e.g., I am less attractive than most other people because of my weight) are rated on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*), and it demonstrated good reliability, $\alpha = .937$,

Body Satisfaction. Using the 6-item Body Image States Scale (BISS; Cash et al., 2002), body satisfaction was assessed through measuring one's affective body image satisfaction state following the directed recollection task. Participants are instructed to report what best describes how they feel right now at this very moment regarding various aspects of appearance on 9-point Likert scales, where lower scores indicate states of lower body satisfaction. This scale demonstrated good reliability, $\alpha = .932$.

Random Assignment Check/Control Variables

Current Hunger. In order to measure current hunger, participants indicated their hunger level on a visual analogue scale from 0 to 100. This type of measurement has been shown to be valid and reliable when measuring appetite (Parker et al., 2004).

Perceived Body Shape. Perceived body shape was measured on a scale from 1 to 7 (*1 = very thin, 4 = average weight, 7 = very heavy*) in accordance with Major et al. (2014).

Internalizing Symptoms. The 21-item Depression Anxiety and Stress Scale (DASS-21; Lovibond & Lovibond, 1995) was used to measure overall internalizing symptoms by combining scores from the stress, depression, and anxiety subscales to get a total score. Participants reported the frequency they experienced each symptom (e.g., I felt that life was meaningless) over the last week on a scale from 0 (*did not apply to me at all*) to 3 (*applied to me very much, or most of the time*). This scale also had good reliability, $\alpha = .921$.

Mood. The 20-item moment version of the Positive and Negative Affect Schedule Scale (PANAS; Watson et al., 1988) was used to measure current positive and negative mood. Participants reported the degree to which particular moods (e.g., enthusiastic) describe how they feel right now, at this very moment on a scale from 1 (*very slightly or not at all*) to 5 (*extremely*). Scores are summed for positive and negative mood individually, where higher scores indicate a greater positive or negative mood. This moment version was reliable, with Cronbach's alphas of .915 and .878 for positive and negative affect, respectively.

Disordered Eating. The 21-item Three-Factor Eating Questionnaire-R21(TFEQ-R21; Cappelleri et al., 2009) was used to assess three domains of eating behavior: cognitive restraint (CR), uncontrolled eating (UE), and emotional eating (EE). This scale has been validated using American adult samples containing all weight statuses (Cappelleri et al., 2009). On a scale from 1 (*definitely false*) to 4 (*definitely true*), participants rate the degree to which they engage in cognitive restraint (e.g., I don't eat some foods because they make me fat), uncontrolled eating (e.g., I'm always hungry enough to eat at any time), and emotional eating (e.g., When I feel sad, I often eat too much). Each subscale is scored by averaging the items, where higher scores indicate a greater tendency towards cognitive restraint, uncontrolled eating, and emotional eating. The subscales demonstrated acceptable reliability, (Uncontrolled $\alpha = .870$, Dietary Restraint $\alpha = .794$, Emotional $\alpha = .908$).

Maternal Influence on Body Image and Eating. The 8-item direct influence subscale of the Parental Influence Questionnaire (PIQ; Abraczinskas et al., 2012) was used to retrospectively measure the extent to which mothers influenced the development of body image and eating disturbance during one's adolescence. Items were slightly modified from parents to primary female caregiver so that maternal influence is specifically measured (e.g., my primary

female caregiver wanted me to be thinner), and items are scored on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores indicate the presence of more maternal influence during adolescence. This scale demonstrated good reliability, $\alpha = .938$.

Demographics. Demographic information such as age, weight, and height were collected at the end of the survey so as not to prime participants to think about their body weight. Body Mass Index (BMI) was calculated using the following formula: [weight (lbs)/(height (in))^2] x 703.

Analytic Plan

The analyses were based on the parallel mediation model depicted in Figure 1 as well as the moderated mediation models depicted in Figures 2 and 3. The parallel mediation model proposes that the relationship between recalling hurtful maternal body-shaming comments and choosing larger portion sizes is mediated by decreased body satisfaction and increased internalized weight bias, internal bodily shame, and external bodily shame. The moderated mediation models determine whether BMI moderates any of these relationships. All descriptive statistics were conducted using IBM SPSS Statistics (Version 26) while mediation models were analyzed using Mplus Version 8 (Muthen & Muthen, 2017).

For the directed recollection task, responses in the shame condition were examined to determine whether they have met the minimum criteria for inclusion (i.e., the response consists of at least 3 sentences or independent clauses, the participant reports feeling at least a little bit shameful in response to the comment, and it describes a comment made by a primary female caregiver or other important female in their life regarding their body weight being too high). The neutral condition was also examined to ensure these responses do not describe their primary female caregiver making comments about their body. Any participants with missing data were deleted.

Prior to conducting any analyses, successful random assignment to conditions was verified by comparing the conditions on current hunger level, the last time they ate, perceived body shape, enjoyability ratings of each food from the portion size selection task, internalizing symptoms, mood, disordered eating tendencies, maternal influence on body image and eating,

and BMI. Variables were excluded from analyses if no significant differences were found between conditions and were included as covariates in the model instead. Furthermore, two mediators (i.e., internalized weight bias and external bodily shame) were excluded from the overall models since both variables were too highly correlated with bodily shame, $r = .82$ and $r = .81$ respectively, therefore raising concerns about multicollinearity.

First, the conceptual parallel mediation model was tested to determine whether weight bias internalization, body satisfaction, and internal and external bodily shame together mediate the relationship between recalling hurtful maternal body-shaming comments and portion size (see Figure 1a). The analyses began by testing the direct path from recalling maternal comments to portion size without any mediators. Then, the individual paths from recalling maternal comments to all of the potential mediators were examined. The individual paths from the mediators to portion size were tested while controlling for recall of maternal comments. Finally, the path from recalling maternal comments to portion size were reassessed while controlling for all mediators. This method involves computing a term that is the product of the path from the predictor to the mediator and the mediator to the outcome. The significance of indirect paths were tested using a bootstrapped distribution of the product itself and a 95% confidence interval. In this case, the bootstrapped distribution was based on 10,000 draws.

It was expected that participants in the maternal body-shaming condition would choose larger portion sizes compared to those in the neutral condition, and this would be due to greater weight bias internalization, lower body satisfaction, greater internal bodily shame, and greater external bodily shame. Since these mediators tend to be correlated (e.g., Lee et al., 2019), sensitivity analyses were then conducted to determine whether internalized weight bias, body satisfaction, internal bodily shame, and external bodily shame individually mediate the

relationship between recalling an experience of receiving hurtful maternal body-shaming comments and portion size when not controlling for the other mediators. These mediation analyses followed the same procedure outlined above for computing and testing the indirect effect in parallel mediation. Finally, moderated mediation models were tested to determine whether BMI moderates any of the paths in the original conceptual parallel mediation model (see Figures 2a and 3a). Significant interactions were followed up by testing appropriate models that included only significant moderated paths.

Results

Descriptive Statistics

On average, participants reported moderately low levels of bodily shame (M = 2.08, SD = 1.16) and chose portion sizes relatively close to the recommended amount of food (M = 7.34, SD = 3.59). Furthermore, average scores were slightly higher than the mid-point for perceived weight and slightly lower than the mid-point for body satisfaction, internalized weight bias, and maternal body influence (see Table 2 in Appendix A). A series of *t*-tests revealed that while the experimental conditions did not significantly differ in reported levels of bodily shame, indicating the body shame manipulation did not work properly, significant differences emerged for maternal body influence during adolescence, perceived body shape, and BMI, where those in the shame condition reported higher levels of each variable (see Table 3). Since maternal body influence during adolescence was measured after the manipulation, those in the shame condition could have been primed to report higher levels of this influence, leading to the observed significant difference. Due to this possibility, as well as the similarity between the measure of maternal body influence and the experimental shame condition, maternal body influence was not used as a control in the following analyses while the other variables were included as covariates[1].

Many variables were significantly correlated (see Table 2). Internal bodily shame was too highly correlated (rs > .80) with both internalized weight bias and external bodily shame to include all three variables as mediators in the same model. Due to concerns with multicollinearity, only internal bodily shame was retained in the parallel mediation model due to

[1] Analyses were run including maternal body influence as a covariate, but they did not indicate strong differences.

its small but significant negative correlation (r = -.12, p = .031) with portion size (see Figure 1b for the final parallel mediation model).

Mediation Models

Parallel Mediation Model

The parallel mediation model revealed that when controlling for the covariate BMI, the total effect of the experimental conditions on portion size was not significant, p = .304. Furthermore, examination of the *a*-path between condition and internal bodily shame revealed that only the covariate BMI had a significant relationship with internal bodily shame, β = .291, SE = .055, p = .001. Similarly, examination of the *a*-path between condition and body satisfaction revealed that only the covariate BMI had a significant relationship with body satisfaction, β = -.360, SE = .049, p < .001. Examination of the *b*-paths revealed that beyond the significant relationship between the covariate BMI and portion size, β = .143, SE = .063, p = .023, only the association between body satisfaction and portion size was approaching significance, β = .150, SE = .079, p = .057, such that those who reported being more satisfied with their bodies chose larger portion sizes. The direct effect of condition on portion size was still not significant when controlling for the mediators and covariates, β = .067, SE = .054, p = .214. Finally, there were no significant indirect effects of the conditions on portion size through either internal bodily shame, b = -.014, SE = .046, p = .754, or body satisfaction, b = -.057, SE = .070, p = .413.

Sensitivity Analyses

For each of the four mediators, sensitivity analyses were run testing individual mediation models linking the recall of maternal body-shaming comments with portion size. This revealed no significant total effects, direct effects, *a*-paths, or indirect effects. However, BMI was

significantly related to each mediator (*ps* < .05) such that those with higher BMIs reported lower body satisfaction, higher internalized weight bias, as well as higher internal and external bodily shame. Furthermore, significant relationships did emerge between certain mediators and portion size. For instance, internal bodily shame was significantly negatively related to portion size, β = -.158, *SE* = .057, *p* = .006, while the positive relationship between BMI and portion size was approaching significance, β = .117, *SE* = .061, *p* = .054. Similarly, internalized weight bias was significantly negatively related to portion size, β = -.200, *SE* = .060 *p* = .001, while the positive relationship between BMI and portion size was significant, β = .158 *SE* = .066 *p* = .017. Finally, body satisfaction was also significantly positively related to portion size, β = .191, *SE* = .052, *p* < .001, while the positive relationship between BMI and portion size was significant, β = .140, *SE* = .063, *p* = .026. Altogether, this indicates that those with lower internal bodily shame and internalized weight bias, as well as those with higher body satisfaction and BMIs, had the tendency to choose larger portions.

Moderated Mediation Models

Bodily Shame and Body Satisfaction. Next, BMI was included as a moderator of all possible paths in the final parallel mediation model, where internal bodily shame and body satisfaction were used as mediators (see Figure 2a). This revealed that BMI significantly moderated only the association between internal bodily shame and portion size, so the moderated mediation model was rerun only including moderation for this single path (see Figure 2b for the final moderated mediation model). Examination of the *a*-paths revealed that the experimental conditions were not significantly related to either internal bodily shame or body satisfaction (*ps* > .05). On the other hand, the covariate BMI was significantly related to the mediators such that those with a higher BMI reported higher internal bodily shame, β = .291, *SE* = .055, *p* < .001,

and lower body satisfaction, β = -.360, *SE* = .049, $p < .001$. Examination of the *b*-paths revealed no main effects; only the interaction between internal bodily shame and BMI was significantly related to portion size, β = .235, *SE* = .065, $p < .001$. Finally, there were no significant indirect effects.

A closer look at the simple slopes indicated that while there was no significant relationship between internal bodily shame and portion size for those with average and larger (+1SD) BMIs, the negative relationship between internal bodily shame and portion size was significant for those with lower (-1SD) BMIs, *b* = -1.013, *SE* = .342, *p* = .003, indicating that higher bodily shame was only associated with choosing smaller portions if a women's BMI was relatively low (see Figure 4). Indeed, according to the Johnson-Neyman region of significance (see Figure 5), there was a negative relationship between internal bodily shame and portion size for individuals with BMI's that are approximately 24.0 and lower (those in the 54th percentile or lower for BMI). However, it also revealed that there was a positive relationship between internal bodily shame and portion size for individuals with BMI's that are approximately 34.8 and higher (those in the 93rd percentile or higher for BMI), indicating that those with higher internal bodily shame only chose larger portions if their BMI's were quite high.

Internalized Weight Bias. Since internalized weight bias was not included in the previous moderated mediation model due to concerns with multicollinearity, a separate moderated mediation model was tested using internalized weight bias as the mediator and BMI as the moderator of all possible paths (see Figure 3a). This revealed only a significant *b*-path interaction, so the moderated mediation model was rerun with only this moderated path (see Figure 3b for the final moderated mediation model). Examination of the *a*-path revealed that condition was not significantly related to internalized weight bias, β = .070, *SE* = .049, *p* = .153.

On the other hand, the covariate BMI was significantly related to the internalized weight bias, β = .434, *SE* = .047, $p < .001$. Examination of the *b*-path revealed that higher internalized weight bias was significantly related to choosing smaller portions, β = -.209 *SE* = .058, $p < .001$, and this was moderated by BMI, β = .164, *SE* = .068, $p = .017$. Finally, there were no significant indirect effects.

A closer look at the simple slopes indicated that while there was no significant relationship between internalized weight bias and portion size for those with larger (+1SD) BMIs, the negative relationship between internalized weight bias and portion size was significant for those with average BMIs, $b = -.481$, *SE* = .132, $p < .001$, and lower (-1SD) BMIs, $b = -.823$, *SE* = .197, $p < .001$, indicating that those with average and lower BMIs who reported higher internalized weight bias chose smaller portions (see Figure 6). Indeed, according to the Johnson-Neyman region of significance (see Figure 7), there was a negative relationship between internal bodily shame and portion size for individuals with BMIs that are approximately 27.9 and lower (those in the 78th percentile or lower for BMI).

Discussion

Even though previous research has provided evidence that disordered eating in young women is linked to early maternal comments about weight and eating (e.g., Fortesa & Ajete, 2014), body dissatisfaction (e.g., Stice & Shaw, 2002), internalized weight bias (e.g., Schvey & White, 2015), and bodily shame (e.g., Doran & Lewis, 2012), little is known about the extent to which these variables are uniquely related to eating behaviors as well as the mechanism underlying these associations. Therefore, the aim of this study was to fill in this gap by experimentally investigating the potential mediating roles of internal and external bodily shame as well as body satisfaction and internalized weight bias in the relationship between recalling a hurtful maternal body-shaming comment from the past and portion size. In addition, the potential moderating role of BMI on these relationships was openly explored.

Overall, the hypothesized parallel mediation model was not supported; internal and external bodily shame, body satisfaction, and internalized weight bias did not mediate a relationship between recalling maternal body-shaming comments and choosing larger portion sizes. In fact, there was no significant relationship between the experimental conditions and portion size. Thus, while a strength of this research is that it is one of the first studies to experimentally investigate the relationships among maternal body-shaming comments, bodily shame, internalized weight bias, body satisfaction, and portion size, the lack of significant effects for the manipulation is unexpected. Indeed, the lack of effect is inconsistent with evidence that participants ate more in a taste test after feelings of general shame were induced by recalling an emotional memory (Chao et al., 2012). Despite similarities in procedures, Chao et al. (2012)

used a taste test to measure eating and only had participants in their shame condition recall a memory of feeling general shame rather than an instance of a maternal body-shaming comment, which may explain the differences in observed effects.

Alternatively, this inconsistency with prior research could be due to an ineffective experimental manipulation in the current study. This seems somewhat likely as condition was not significantly related to internalized weight bias, body satisfaction, or internal and external bodily shame. The weakness of the manipulation could potentially account for the lack of findings supporting the hypotheses, including no indirect effects. For instance, the directed recollection task does not fully represent the experience of receiving maternal comments in person, and some participants may not have put in enough effort to vividly replay the memory in their head. Furthermore, the task involved participants recalling a time when their mother made them feel bad about their body. This was interpreted many different ways, so perhaps the manipulation also failed due to the lack of specificity directing participants towards recalling moments of feeling bodily shame, especially regarding being too big.

Surprisingly, the hypothesis that higher bodily shame, higher internalized weight bias, and lower body satisfaction would lead participants to choose larger portion sizes was not supported. Indeed, sensitivity analyses revealed that while external bodily shame was unrelated to portion size, higher internal bodily shame, higher internalized weight bias, and lower body satisfaction were in fact significantly related to choosing smaller portions. Separate moderated mediation models indicated that BMI moderated certain relationships. However, just as the sensitivity analyses revealed, the underlying associations were mostly opposite to the expected direction. Internalized weight bias was negatively related to portion size for individuals with BMIs 27.9 and lower (those in the 78th percentile or lower), indicating that high internalized

weight bias was significantly linked to choosing smaller portions only for individuals who were not overweight or only somewhat overweight (BMI for overweight status is from 25.0-29.9; Centers for Disease Control and Prevention, 202). For instance, those with low BMIs (-1SD) and high internalized weight bias (+1SD) had average portion sizes of 5.46 while those with low BMIs and low internalized weight bias (-1SD) had average portion sizes of 8.04 (note that a healthy portion size was a "7" in the task). In addition, internal bodily shame was negatively related to portion size only for individuals with BMIs 24.0 and lower (those in the 54th percentile or lower), meaning that high internal bodily shame was significantly linked to eating smaller portion sizes mainly for individuals in the healthy weight status (BMI from 18.5-24.9; Centers for Disease Control and Prevention, 2021) and below. Similar to findings for internalized weight bias, those with low BMIs (-1SD) and high internal bodily shame (+1SD) had average portion sizes of 5.64 while those with low BMIs and low internal bodily shame (-1SD) had average portion sizes of 7.99.

These findings are inconsistent with evidence that experiences of bodily shame are related to eating more over the span of a week (Troop, 2016) as well as correlational evidence that bodily shame, internalized weight bias, and body satisfaction are positively related to binge eating (e.g., Lee et al., 2019). However, they are somewhat consistent with evidence that bodily shame is positively related to a measure of disordered eating that assesses restricted eating as well as eating, shape, and weight concerns (Oliveira et al., 2019). Specifically, the differences in average portion sizes found in the current study correspond to portions that are either above (> 7) or below (< 7) the recommended portion size for the foods in the task, where average sizes of 5.50 indicate 85% of the recommended portion while average sizes of 8 indicate 110% of the

recommended portion. This suggests that the selection of smaller portion sizes likely mimics dietary restraint in which food intake is restricted to below normal levels.

Upon closer examination, this finding is somewhat consistent with the second proposed pathway in the dual pathway model of bulimic behavior in which restricted eating patterns can be adopted as a response to body dissatisfaction and sociocultural pressures to be thin, which in turn can lead to bulimic symptoms such as binge eating and purging (Stice, 2001). Even though previous longitudinal research has both succeeded (Stice et al., 2002) and failed (Spoor et al., 2006) to support this pathway for adolescent females, the current study suggests that internal bodily shame and internalized weight bias could potentially play a key role in the adoption of restricted eating patterns for young adult women with low and healthy BMIs. This effect could suggest that individuals with low and healthy BMIs who have body dysmorphic cognitions consistent with feelings of bodily shame and internalized weight bias are more at risk for this restricted eating pathway toward bulimic behavior. It is unknown from the current study, however, whether this restricted eating places these individuals at a higher risk of binge eating.

Despite these unexpected findings, a relationship did emerge that was in the hypothesized direction; internal bodily shame was in fact positively related to portion size for those with BMIs 34.8 and higher, indicating that high internal bodily shame was related to eating larger portions for many individuals in the obese weight status (BMIs of 30.0 and above; Centers for Disease Control and Prevention, 2021). This finding is consistent with the expectation that the positive relationship between bodily shame and portion size would be especially strong for those with larger BMIs. Even though this relationship was only true for a small percentage of the sample (7%), it is consistent with previous evidence that bodily shame predicts binge eating (Duarte et al., 2014; Duarte & Pinto-Gouveia, 2017), especially for those with larger BMIs (Lee et al.,

2019) as well as eating more over the course of a week (Troop, 2016). Furthermore, it is also consistent with the weight stigma and well-being process model (Tylka et al., 2014) as well as the negative affect regulation pathway of the dual pathway model (Holmes et al., 2015) since they both predict that high bodily shame is linked to overeating behaviors.

The overall findings therefore support both pathways in the dual pathway model of bulimic pathology (Stice, 2001), in which pressures to be thin, and internalizing this thin-ideal, are linked to body dissatisfaction, which in turn is linked to bulimic symptomology such as binging and purging either through dieting and restricted eating or through overeating as a result of experiencing negative affect. The differences in chosen portion sizes in the current study could potentially mirror the different eating patterns associated with each pathway in the model since portion size was significantly correlated with dietary restraint (r = -.21, p < .001) as well as uncontrolled eating (r = .14, p = .01). BMI would then function as a determining factor for which pathway operates for a given individual. The findings suggest that while high bodily shame and internalized weight bias encourage individuals with smaller bodies to diet and restrict their eating, the negative affect associated with these cognitions and emotions encourages individuals with larger bodies to engage in uncontrolled overeating patterns.

Indeed, this explanation helps to clarify mixed findings in the existing literature on disordered eating more broadly. For instance, bodily shame is consistently linked to both binge eating (e.g., Duarte et al., 2014; Lee et al., 2019) and restricted eating (Oliveira et al., 2019), but little research has examined why the same emotion results in different disordered eating patterns for different individuals. There is now evidence that BMI may ultimately influence which, if any, effects bodily shame has on eating behaviors.

Limitations

Despite these strengths, there are various limitations of the current study. For instance, this experiment had to be conducted entirely online due to COVID-19 restrictions, so actual eating behaviors were not assessed in line with typical procedures for measuring portion size (i.e., a taste test). While there is evidence that online portion size selection tasks produce similar results to in-person taste tests (Wilkinson et al., 2012), inconsistencies between the current findings and those of prior research could be due to this methodological difference. Furthermore, a general limitation of experimental methodology involving eating behaviors is that even though the portion size selection task was informative, it is limited in scope because it cannot be directly tied to disordered eating. However, since portion size was significantly correlated with measures of dietary restraint and uncontrolled eating, and these correlations were in the expected direction, there is some validity in the speculation that choosing smaller portion sizes was mimicking dietary restraint while choosing larger portion sizes was mimicking uncontrolled overeating.

In addition, another limitation is that multiple of the proposed mediators (i.e., internal bodily shame, external bodily shame, and internalized weight bias) were too highly correlated that they had to be excluded from the model. In turn, certain hypotheses could not be tested, such as comparing the unique effects of internal versus external bodily shame on portion size, despite correlational differences emerging where higher internal bodily shame was significantly related to smaller portions and external bodily shame was unrelated to portion size. Furthermore, an issue arose such that maternal body influence during adolescence was different between conditions, where those in the shame condition reported experiencing significantly more influence from their mothers than the neutral condition. Since the measure of maternal body influence was assessed after the manipulation in order to not prime participants in the neutral

condition, it's possible that the shame manipulation in fact primed those participants to report higher levels of this influence. However, due to inclusion criteria for the shame condition, it is also possible that individuals with less maternal body influence were excluded from analyses. In order to test whether this had an effect on any of the observed relationships, analyses were run with and without maternal body influence being controlled, and the findings yielded similar results.

Future Directions

Future research should continue to experimentally explore the relationship between maternal body influence and disordered eating behaviors. For instance, a quasi-experiment could assign those who experienced a certain level of maternal body influence during adolescence to the shame recollection condition while assigning those with little to no experience to the neutral recollection condition. This alteration has the potential to strengthen the manipulation and reveal hypothesized associations since participants in the shame condition would more easily recall receiving hurtful body-shaming comments from mothers. The body size of participants when they received these comments should also be measured and considered in addition to their current body size since it could have unique effects on their emotions and eating behaviors.

Furthermore, future research should determine whether certain effects found in the current study are generalizable, such as to the reception of body-shaming comments from fathers as well as linking these comments to bodily shame and disordered eating behaviors in young adult men. In addition, some participants wrote about times their mothers shamed them for being too skinny. Since this was outside the scope of this study and therefore excluded from analyses, future studies should determine whether recalling these particular experiences led to differences in portion size, potentially due to bodily shame, internalized weight bias, or body dissatisfaction.

The results of the current study should also be extended to adolescents, where future research should explore within-person and family differences by seeking to determine whether fluctuations in receiving body-shaming comments from parents over time relates to fluctuations in adolescent eating patterns such as dietary restraint or overeating.

Furthermore, the role of bodily guilt, or feeling bad about behaviors related to your body, in disordered eating should be explored in future research as well as how bodily guilt operates distinctly from bodily shame when influence eating behaviors. More broadly, the guilt and shame literature theorize that guilt tends to be more adaptive than shame since guilt focuses negative emotions on changeable behaviors while shame focuses these negative emotions on more stable attributes about oneself (Tangney & Tracy, 2012). Because of this distinction, it is possible that feelings of bodily guilt and shame lead to either more or less adaptive responses, such as restricted and uncontrolled eating. Finally, future research should seek to better disentangle the link between choosing portion sizes and disordered eating in order to make a stronger link between the dual influence of internal bodily shame on eating behaviors.

Concluding Remarks

Despite limitations, the current study investigated the relationships among recalling hurtful maternal body-shaming comments, bodily shame, internalized weight bias, body satisfaction, and portion size. It adds to a literature that links receiving maternal body comments during adolescence to specific eating patterns for young adult women. Overall, the current study suggests that high internal bodily shame has a dual effect on portion size depending on BMI, where individuals with larger bodies are more likely to choose larger portions and individuals with smaller bodies are more likely to choose smaller portions when faced with high bodily

shame. Future research should continue to disentangle the complex mechanisms linking maternal body influence, internal bodily shame, and disordered eating behaviors.

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Appendix A

Tables and Figures

Table 1

Order of Tasks and Measures

Construct	Purpose	Task/Scale Name	# of items
Mood	Control/Random Assignment Check	Positive and Negative Affect Schedule Scale - Moment version (PANAS; Watson et al., 1988)	20
Current Hunger & Perceived Weight	Control/Random Assignment Check	Items with 7-point Likert scales	2
Internalizing Symptoms	Control/Random Assignment Check	Depression, Anxiety, and Stress Scale (DASS-21; Lovibond & Lovibond, 1995)	21
Maternal Body-Shaming Comments	Predictor	Directed Recollection Task (Neutral and Body Shame)	2 or 4
Body Satisfaction	Mediator	Body Image States Scale (BISS; Cash et al., 2002)	6
Weight Bias Internalization	Mediator	Modified Weight Bias Internalization (WBIS-M; Pearl & Puhl, 2014)	11
Internal Bodily Shame	Mediator	Adapted version of State Guilt and Shame Scale (SGSS; Marschall et al., 1994)	10
External Bodily Shame	Mediator	Adapted version of Other As Shamer Scale -2 (OAS2; Matos et al., 2015)	8
Portion Size	Outcome	Portion Size Selection Task	10
Disordered Eating Symptoms	Control/Random Assignment Check	Three-Factor Eating Questionnaire-R21 (TFEQ-R21; Cappelleri et al., 2009)	18
Maternal Body Image and Eating Influence	Control/Random Assignment Check	Parental Influence Questionnaire - Direct Influence subscale (PIQ; Abraczinskas et al., 2012)	8

Table 2

Means and Correlations

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Portion Size	**7.34**	3.59														
2. Internal Bodily Shame	**2.08**	1.16	-.12*													
3. External Bodily Shame	**2.08**	1.05	-.05	.81***												
4. Body Satisfaction	**4.80**	1.81	.13*	-.71***	-.67***											
5. Internalized Weight Bias	**3.53**	1.56	-.12*	.82***	.77***	-.78***										
6. Maternal Body Influence	**2.79**	1.29	.03	.40***	.37***	-.31***	.43***									
7. Body Mass Index	**25.10**	5.45	.08	.30***	.31***	-.37***	.44***	.35***								
8. Perceived Body Shape	**4.13**	1.15	.03	.32***	.32***	-.38***	.46***	.36***	.80***							
9. Internalizing Symptoms	**1.86**	0.57	-.06	.44***	.44***	-.35***	.40***	.20***	.11^{+}	.07						
10. Positive Affect	**24.13**	8.80	-.01	-.16**	-.16**	.22***	-.18**	-.14*	-.07	-.06	-.09					
11. Negative Affect	**16.76**	6.87	-.03	.26***	.28***	-.20***	.23***	.08	.02	.05	.58***	.17**				
12. Dietary Restraint	**2.28**	0.85	-.21***	.47***	.44***	-.36***	.52***	.24***	.04	.10^{+}	.26***	-.05	.20***			
13. Uncontrolled Eating	**2.13**	0.65	.14**	.46***	.48***	-.32***	.45***	.18**	.16**	.28***	.22***	-.08	.14**	.34***		
14. Emotional Eating	**2.20**	0.85	.10^{+}	.44***	.48***	-.38***	.48***	.25***	.33***	.37***	.24***	-.11*	.16**	.35***	.74***	
15. Condition	**0.52**	0.50	.07	.07	.07	-.10^{+}	.13*	.31***	.13*	.16**	.05	-.05	.001	.05	.02	.06

Note. $^{+}p < .10$, $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

Table 3

Means by Condition

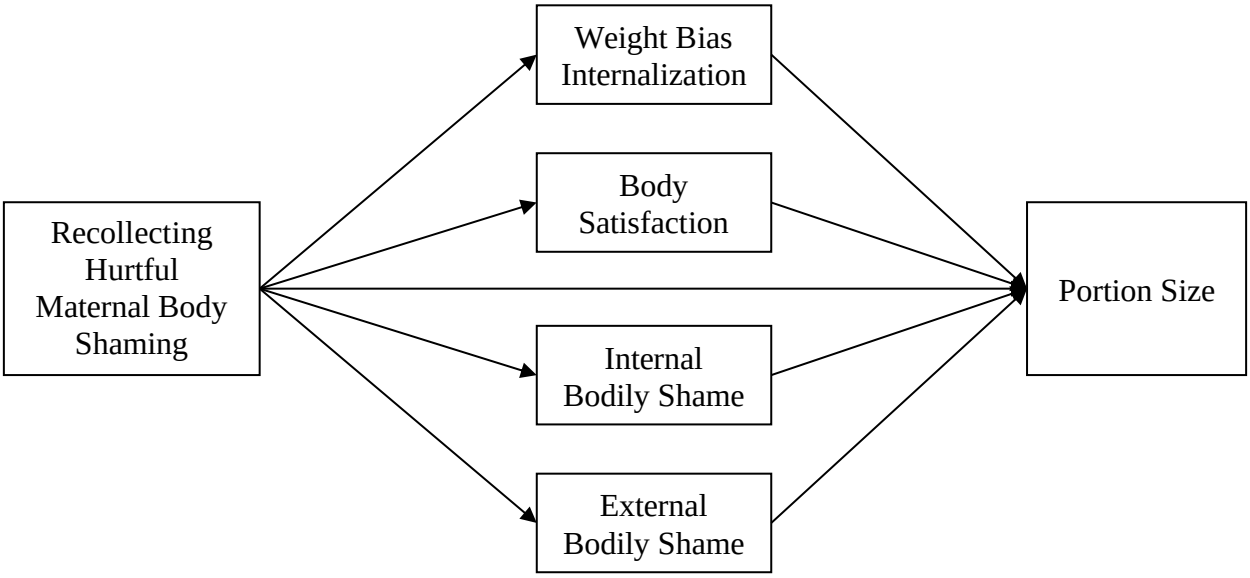
	Shame Condition		Neutral Condition		
	M	SD	M	SD	*t*-test
Outcome Variables					
Portion Size[a]	7.57	3.54	7.09	3.62	-1.20
Internal Bodily Shame[a]	2.16	1.17	2.00	1.15	-1.28
External Bodily Shame[a]	2.15	1.06	2.00	1.03	-1.33
Body Satisfaction[a]	4.62	1.85	4.99	1.75	1.81^{+}
Internalized Weight Bias[a]	3.72	1.56	3.32	1.54	-2.31*
Correlates/Control Variables					
Maternal Body Influence[a]	3.17	1.19	2.38	1.26	-5.82***
Dietary Restraint[a]	2.31	0.83	2.24	0.87	-0.82
Uncontrolled Eating[a]	2.14	0.64	2.12	0.67	-0.34
Emotional Eating[a]	2.24	0.83	2.15	0.87	-1.03
Body Mass Index (BMI)[a]	25.76	5.61	24.36	5.18	-2.33*
Perceived Body Shape[b]	4.30	1.10	3.94	1.17	-2.87**
Internalizing Symptoms[b]	1.88	0.58	1.82	0.55	-0.97
Positive Affect[b]	23.70	8.75	24.60	8.87	0.93
Negative Affect[b]	16.76	7.09	16.75	6.63	-0.02
Hunger Level[b]	3.77	1.70	3.71	1.55	-0.38

Note. [a] indicates the variable was assessed after the manipulation while [b] indicates the variable was assessed before the manipulation. $^{+}$ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

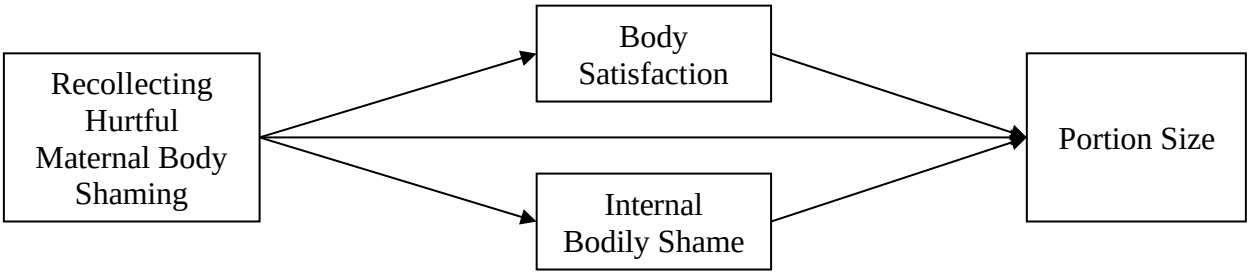
Figure 1

Parallel Mediation Model

(a)



(b)

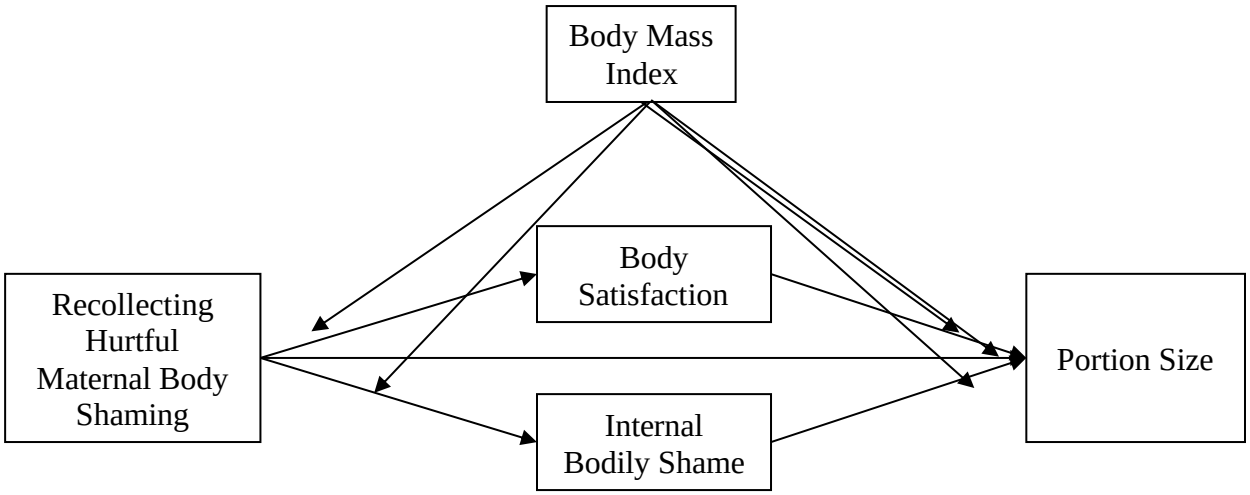


Note. The full conceptual parallel mediation model is depicted in (a) while the final model is depicted in (b).

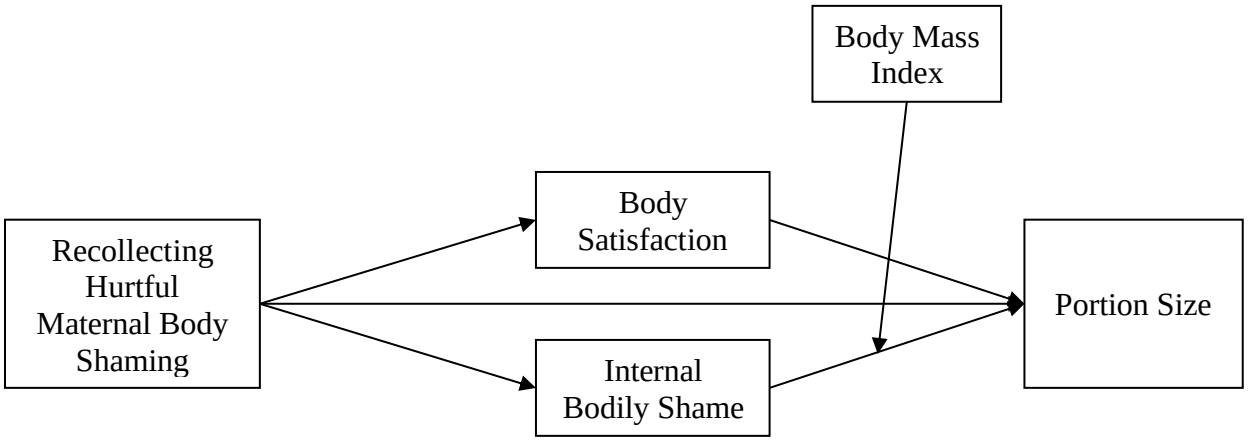
Figure 2

Moderated Mediation Model

(a)



(b)

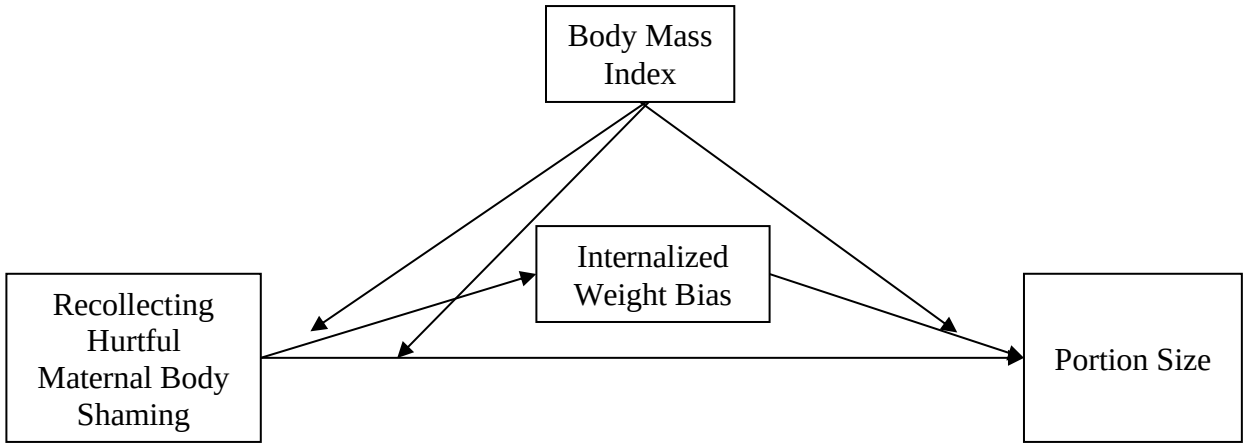


Note. The full conceptual moderated mediation model is depicted in (a) while the final model is depicted in (b).

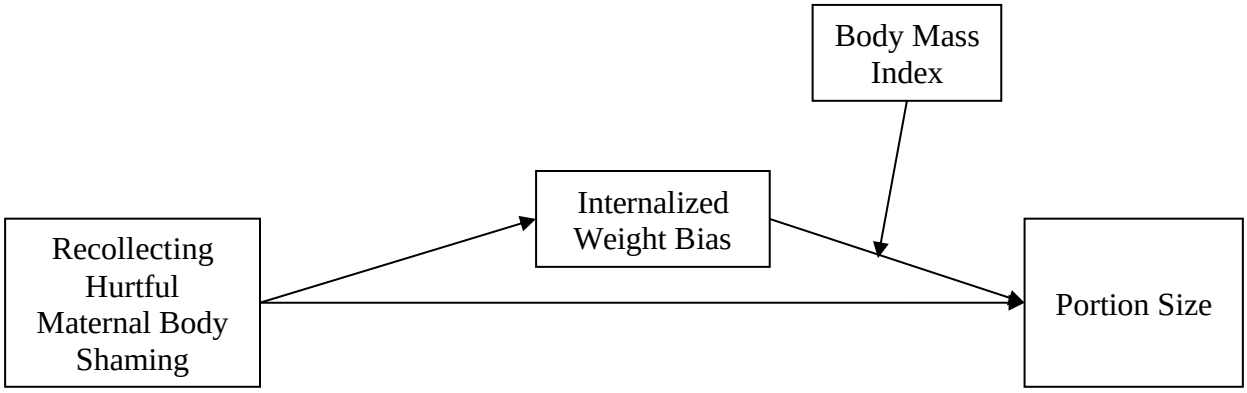
Figure 3

Moderated Mediation Model – Internalized Weight Bias

(a)



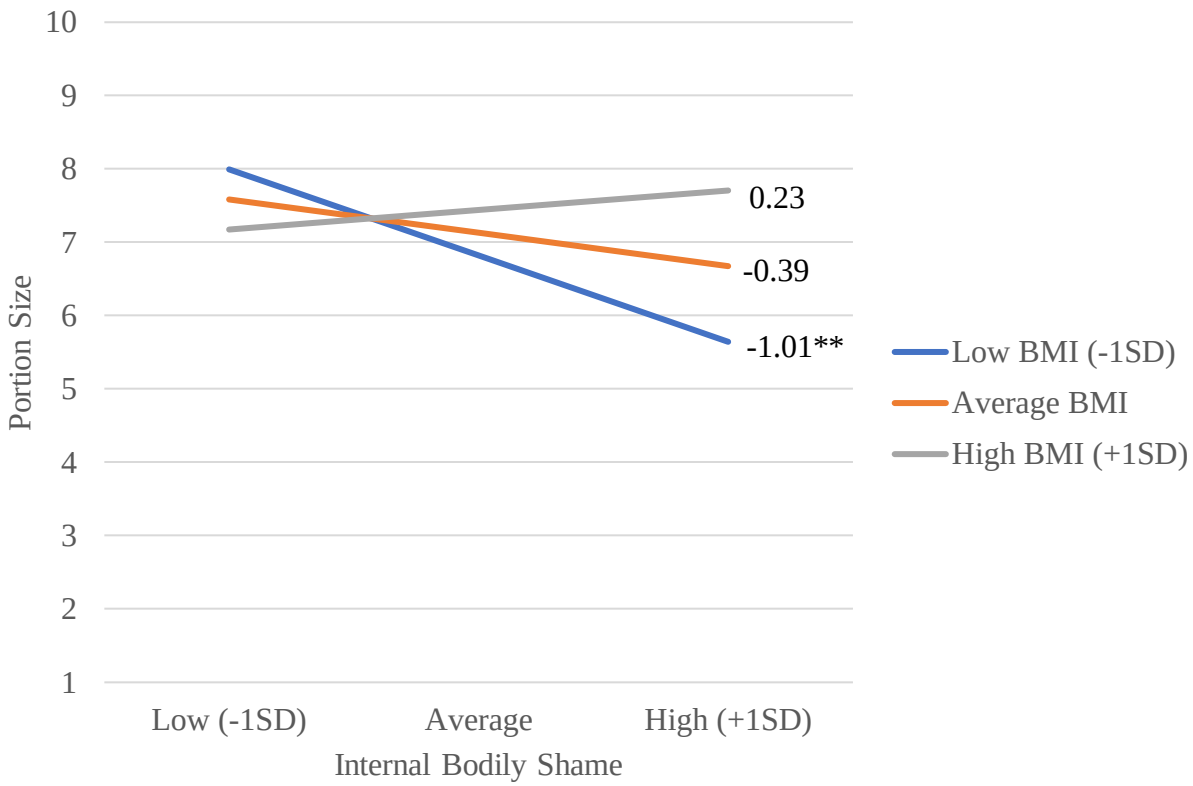
(b)



Note. The full conceptual moderated mediation model is depicted in (a) while the final model is depicted in (b).

Figure 4

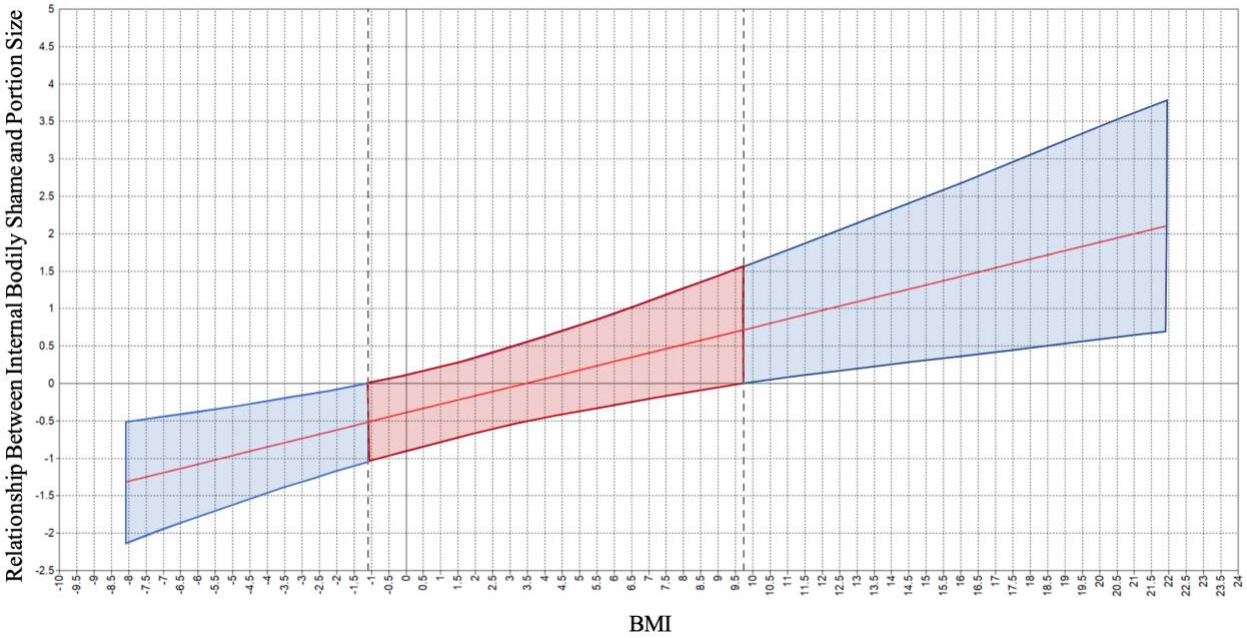
Interaction Between Internal Bodily Shame and BMI on Portion Size



Note. *** $p < .001$

Figure 5

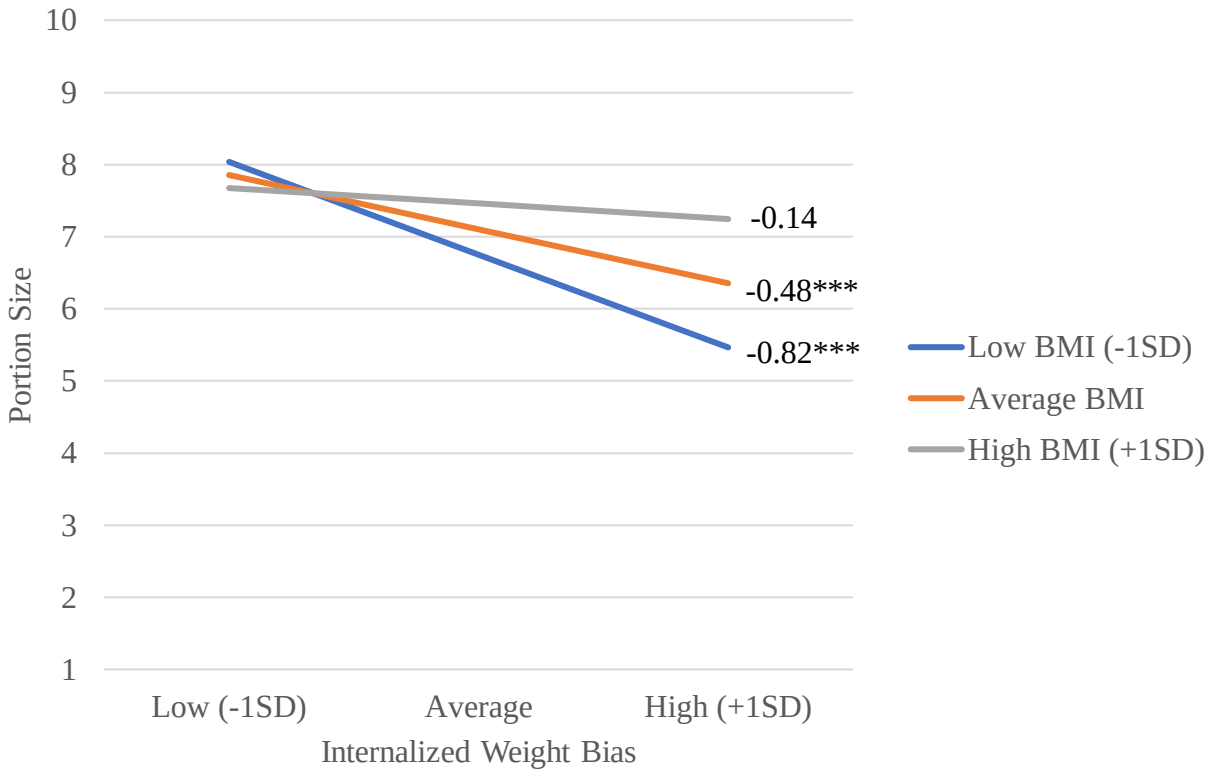
Johnson-Neyman Region of Significance Plot – Internal Bodily Shame and Portion Size



Note. BMI is centered such that the average BMI of 25.10 is represented by a 0. Blue regions indicate significance at $p < .05$ while the red region indicates non-significance.

Figure 6

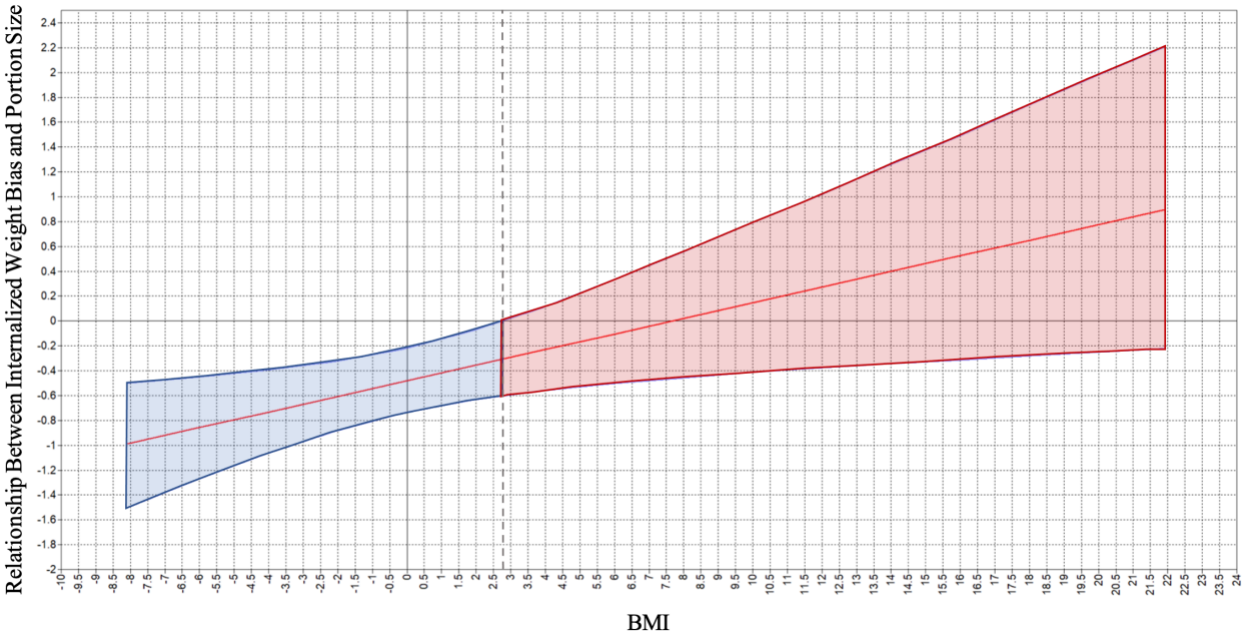
Interaction Between Internalized Weight Bias and BMI on Portion Size



Note. *** $p < .001$

Figure 7

Johnson-Neyman Region of Significance Plot – Internalized Weight Bias and Portion Size



Note. BMI is centered such that the average BMI of 25.10 is represented by a 0. Blue regions indicate significance at $p < .05$ while the red region indicates non-significance.

Appendix B

Maternal Body-Shaming Comments - Directed Recollection Task

Shame Condition

Think about a memorable time in the last 10 years when your primary female caregiver (e.g., mother) made a comment that made you feel bad about your body (e.g., "It looks like you've been putting on the pounds. You should start eating healthier and working out more often"). Replay this memory in your head for about a minute and think about all the details as vividly as you can. Then, describe it below in 3-4 sentences; what did she say and why? How did you feel then? How did you respond, or what did you do?

If your primary female caregiver has never said something like this to you, write about a time that any female relative or other important female person in your life made such a comment.

Neutral Condition

Think about a memorable time in the last 10 years when you had a conversation with your primary female caregiver (e.g., mother) that you found to be very boring (e.g., "It looks like my stamp collection is almost complete. You should think about starting your own"). Replay this memory in your head for about a minute and think about all the details as vividly as you can. Then, describe it below in 3-4 sentences; what did she say and why? How did you feel then? How did you respond, or what did you do?

Appendix C

Modified Internal Bodily Shame Scale

Adapted version of State Guilt and Shame Scale – Shame subscale (Marschall et al., 1994)

The following are some statements which may or may not describe how you are feeling **right now**. Please rate each statement using the 5-point scale below. Remember to rate each statement based on how you are feeling **right at this moment.**

Not At All	Slightly	Moderately	Very Much	A Great Deal
1	2	3	4	5

1. I want to sink into the floor and disappear because of my body.
2. I feel insignificant because of my body.
3. I feel like I am a bad person because of my body.
4. I feel humiliated and disgraced because of my body.
5. I feel worthless because of my body.

Appendix D

Modified External Bodily Shame Scale

Adapted version of Other As Shamer Scale-2 (Matos et al., 2015)

The following are some statements which may or may not describe how you are feeling **right now**. Please rate each statement using the 5-point scale below. Remember to rate each statement based on how you are feeling **right at this moment.**

Not At All	Slightly	Moderately	Very Much	A Great Deal
1	2	3	4	5

1. I think that other people look down on me because of my body.
2. People distance themselves from me because of my body.
3. Others think there is something missing in me because of my body.
4. People see me as unimportant compared to others because of my body.
5. Other people see me as not measuring up to them because of my body.
6. Other people see me as somehow defective as a person because of my body.
7. Others think there is something missing in me because of my body.
8. Others see me as empty and unfulfilled because of my body.