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Weight stigma predicts inhibitory control and food selection in response to the salience of weight discrimination

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Abstract

Objective—Fear and stigmatization are often used to motivate individuals with higher body weight to engage in healthy behaviors, but these strategies are sometimes counterproductive, leading to undesirable outcomes. In the present study, the impact of weight-based stigma on cognition (i.e., inhibitory control) and food selection (i.e., calories selected) was examined among individuals who consider themselves to be overweight. It was predicted that participants higher in perceived weight stigma would perform more poorly on an inhibitory control task and order more calories on a food selection task when they read about discrimination against individuals with higher weight versus discrimination against an out-group.

Methods—Participants completed online prescreen measures assessing whether they considered themselves to be overweight and their perceptions of weight stigma. Individuals who considered themselves to be overweight were invited into the laboratory to complete tasks that manipulated weight-based discrimination, then inhibitory control and food selection were measured.

Results—The higher participants were in perceived weight stigma, the more poorly they performed on the inhibitory control task and the more calories they ordered when they read about discrimination against individuals with higher body weight. These relationships were not observed when participants read about discrimination against an out-group.

Conclusions—The present findings provide evidence that perceptions of weight stigma are critical in understanding the impact of weight-based discrimination. Additionally, these results have theoretical and practical implications for both understanding and addressing the psychological and physical consequences of weight-based stigma.

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Keywords

Weight Stigma; Eating Behavior; Cognition; Inhibitory Control; Discrimination

Increased prevalence of obesity in the United States has led to discussion and framing of the issue as a threat to the health care system and as a societal burden to others (e.g., Mann, Tomiyama, & Ward, 2015; Tomiyama, 2014). Viewing the problem in this manner may open the door to weight-based stigmatization of individuals with higher body weight (e.g., Tomiyama et al., 2014). Weight stigma, the social depreciation and condemnation of individuals with higher body weight, can contribute to poor health factors that underlie some forms of obesity and can result in prejudice, bias, and stereotyping against these individuals (e.g., Major, Eliezer, & Rieck, 2012; Mann et al., 2015; Puhl & Brownell, 2001; Tomiyama et al., 2014). Stigmatization of those with higher body weight can also result in increased discrimination toward these individuals, rendering them vulnerable to negative physical and psychological consequences, such as harmful eating behaviors and poor body image (e.g., Puhl & Heuer, 2009; Tomiyama, 2014). Although the physical and psychological consequences of weight stigma are presumed to be many (see Major et al., 2012; Major, Hunger, Bunyan, & Miller, 2014; Wott & Carels, 2010), further research is needed to examine the circumstances under which weight stigma impacts cognition and behavior.

Stigma is a broad construct that involves, among many other attributes, discrimination (Link & Phelan, 2001). Discrimination has been defined as the experience of differential treatment based on one's group membership (e.g., Andreyeva, Puhl, & Brownell, 2008; Major, Quinton, & McCoy, 2002). Of particular importance is the subjective experience of stigma, or perceived stigma, which is the extent to which one perceives that they are the target of discrimination (e.g., Major & O'Brien, 2005). Both perceived stigma and discrimination have been shown to predict negative cognitive and behavioral outcomes. Perceptions that one experiences discrimination (i.e., perceived stigma) among various groups (e.g., women, African Americans) have been found to be associated with negative psychological and physiological health consequences (e.g., Crocker & Major, 1989; Schmitt & Branscombe, 2002). The perception that one is discriminated against based on their weight (i.e., perceived weight stigma), specifically, has been linked to binge eating (Wott & Carels, 2010). Relatedly, the salience of weight has been found to impact cognition among individuals who are heavier in weight (e.g., making weight salient predicts poor performance on cognitive tasks; Major et al., 2012). Although the impacts of perceived weight stigma and the experience of weight-based discrimination on various outcomes have been shown, little research has examined how one's perceptions of weight stigma may be moderated by the saliency of weight-based discrimination. As such, the current study sought to extend previous research by examining the relationships between perceived weight stigma and both cognitive functioning and eating behavior when weight discrimination was made salient.

Perceptions of Stigmatization

Research has shown that individuals with higher body weight may experience threat in situations that remind them more generally of negative stereotypes and devaluation of those

with higher body weight (Hunger, Major, Blodorn, & Miller, 2015; Major et al., 2012; Major et al., 2014); however, not everyone may respond the same to this situation. One's subjective evaluation of an experience has been suggested to influence outcomes to a greater extent than the objective experience of discrimination itself (e.g., Major et al., 2002; Pinel, 1999). It has also been suggested that expectations of being stigmatized by others can shape individuals' perceptions of discriminatory events, such that individuals who are more conscious of the stigma their group faces experience more negative consequences (Pinel, 1999). Relatedly, if individuals do not perceive themselves to be stigmatized based on their weight, then weight-based discrimination might not have the same impact on them as on individuals who do perceive themselves to be stigmatized based on their weight. Because previous findings have suggested that the subjective perception of discrimination is associated with negative consequences and that experiencing stigma can lead individuals to anticipate or expect to be discriminated against, it is important to understand the relationship between perceptions of stigma and experiences of discrimination. Accordingly, the current research highlights the importance of considering how perceptions of stigma interact with a situation to influence cognitive and behavioral outcomes.

Weight Stigma and Cognitive Control

Previous research examining other stigmatized groups has revealed a negative association between perceived stigma and individuals' self-regulatory abilities. Inzlicht, McKay, and Aronson (2006) found that African American undergraduate college students' sensitivity to stigma and self-regulation of behavior were negatively associated when stigma was salient, but not when stigma was not salient. Inzlicht and Kang (2010) also showed that experiencing stereotype threat produced by a math test led female undergraduate college students to eat significantly more ice cream. When women engaged in a stereotype threat intervention (coping task), they ate less ice cream, indicating they were better able to engage in restraint. These findings are likely to extend to other forms of stigma (e.g., weight stigma).

Research examining weight has suggested that decreased executive control may be a consequence of experiencing weight stigma. Executive control is a general term used to describe higher order cognitive processes that control and regulate lower order processes and behaviors directed toward future goals (Alvarez & Emory, 2006). Major et al. (2012) showed that when weight was made salient for female participants in a situation considered to be highly evaluative for individuals who are higher in body weight (i.e., a videotaped speech about why one would make a good dating partner), considering oneself to have higher body weight was positively associated with poorer performance on an executive control task. The researchers concluded that the potential for weight-based rejection among individuals who considered themselves to have higher body weight led to cognitive depletion when participants were in a situation that is typically evaluative for those who are higher in body weight (Major et al., 2012). Although ones' perceived weight does not directly measure perceptions of weight stigma, it seems plausible that this may be a proxy for weight stigma. This lends support to the notion that perceptions of weight stigma may also be important for predicting who experiences cognitive depletion in response to weight-based discrimination.

The aforementioned findings suggest there may be negative consequences of weight stigma for other cognitive functions (e.g., inhibitory control). Inhibitory control is the component of executive function that suppresses unnecessary or inappropriate responses to stimuli or situations, and affords individuals the ability to exercise inhibition of behavior when necessary to achieve goals (Verbruggen & Logan, 2009). The impact of weight stigma on inhibitory control has been discussed in the existing literature; however, the interactive effect of perceptions of weight stigma and experiences of weight discrimination on inhibitory control has yet to be examined.

Weight Stigma and Eating Behavior

A link between weight stigma and problematic eating behaviors has been observed consistently in previous research. Wott and Carels (2010) suggested that the experience of weight-based discrimination or stigma could negatively influence individuals with higher body weight in a variety of ways, including serving as a trigger for maladaptive eating behaviors (e.g., binge eating). For example, weight stigma has been shown to predict binge eating in college students (Almeida, Savoy, & Boxer, 2011), adults higher in body weight (Ashmore, Friedman, Reichmann, & Musante, 2008), and children/adolescents higher in body weight (see Puhl & Latner, 2007 for a review).

The association between weight stigma and other maladaptive eating behaviors has also been supported by recent research. Major et al. (2014) showed that women who perceived themselves to have higher body weight reported feeling less capable of self-control over their eating behavior when exposed to stigmatizing articles, compared to control participants. Additionally, the more women perceived themselves to have higher body weight, the more calories they consumed when exposed to stigmatizing articles, compared to control participants (Major et al., 2014). Wellman, Araiza, Newell, and McCoy (2017) found that perceived weight stigma was positively associated with both emotional and rigid restraint eating, and that perceived weight stigma actually predicted weight gain over a 10-week period. Other studies have also identified weight stigma as a predictor of disordered eating (Ashmore et al., 2008; Piran & Thompson, 2008), emotional eating (Farrow & Tarrant, 2009; O'Brien et al., 2016; Wellman et al., 2017), and increased calorie consumption (Major et al., 2014; Schvey, Puhl, & Brownell, 2011). Durso, Latner, and Hayashi (2012) also showed that experiences of discrimination among individuals with higher body weight predicted both emotional and binge eating. Weight-related teasing among adolescents has further been shown to predict extreme dieting behaviors five years later in life (Haines, Neumark-Sztainer, Eisenberg, & Hannan, 2006).

Similar to stigma, stereotype threat has been shown to have consequences for eating behavior. Stereotype threat has been defined as the threat of confirming a negative stereotype thought to be characteristic of one's group (Steele & Aronson, 1995); often this concern ironically may lead to behavior which confirms the stereotype (e.g., women taking a math test perform worse when reminded of the stereotype that women are not good at math). Brochu and Dovidio (2013) showed that participants who experienced stereotype threat relevant to their weight ordered more calories on a menu selection task when they were higher in body weight. The authors highlighted the negative impact of stereotype threat

relevant to weight on food selection, and suggested weight stigma as a factor that may promote or contribute to unhealthy eating (Brochu & Dovidio, 2013). Taken together, these findings provide support for the association between weight stigma and maladaptive eating patterns.

The Present Study

Although a variety of research has found correlational evidence for the association between weight stigma and eating behaviors (see Vartanian & Porter, 2016), little research has examined how the situational context interacts with one's subjective perception of stigmatization to predict eating. The effects of weight stigma on cognitive function are also in need of greater exploration. Specifically, the interaction between perceived weight stigma and weight discrimination as a predictor of inhibitory control has yet to be examined. Furthermore, studies on perceived weight stigma often examine weight status or BMI as proxies for perceived weight stigma but, in the present study, perceptions of weight stigma among individuals with higher body weight were examined directly.

The primary focus of the present study was to examine the interaction of perceived weight stigma and the salience of weight discrimination as a predictor of inhibitory control and, to add to the literature on weight stigma and eating, as a predictor of food selection. It was expected that perceived weight stigma would lead to decreased inhibitory control and to increased calories selected when participants were reminded about discrimination against individuals with higher body weight, but not when they were reminded about discrimination against a self-irrelevant out-group.

Finally, based on prior literature suggesting links between weight stigma, cognitive function, and eating behavior, it was also hypothesized that inhibitory control would mediate the relationship between perceived weight stigma and food selection for participants in the weight discrimination condition, but not for control participants. Specifically, when weight discrimination was made salient, it was expected that perceived weight stigma would lead to decreased inhibitory control, which would subsequently lead to increased calories ordered on the food selection task, but that this relationship would not be observed for participants in the control condition. Although weight stigma has been associated with rigid eating and extreme dieting in previous studies, such attempts are often not successful, and have, ironically, been associated with weight gain over time (Wellman et al., 2017). Therefore, it was expected that weight stigma would lead to reduced control over eating-related behavior in the present study.

Methods

Participants

A total of 101 participants were recruited from social sciences classes at a southwestern university. Participants were selected based on their self-reported weight status; specifically, they indicated on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*) the extent to which they considered themselves overweight. Participants who reported a score of 5 or greater on this item, which indicated that they considered themselves overweight, were given the

opportunity to sign up for a time slot to participate in the laboratory portion of the study. Participants were unaware of selection criteria for the experimental study session.

For their involvement in the study, participants received their choice of either a $10.00 Amazon gift card or credit to be applied toward their courses. Nine participants were excluded from the final analysis for not completing all three tasks (four participants due to technical issues linking from one task to the next and five participants for failure to manually continue to the final task). An additional eight participants were removed as outliers on the calorie task for ordering more than 10,000 calories, indicating a lack of attention or lack of understanding of the task instructions.

The final sample consisted of 84 participants (Gender: 76 Female, 8 Male[1]; Age: $M = 21.42$, $SD = 5.38$, range: 18–52; Race/Ethnicity: 67.9% Hispanic/Latino American, 11.9% Mixed, 8.3% White, 6.0% African American, 2.4% Native American, 2.4% Other, 1.2% Asian American). Additionally, height (inches) and weight (pounds) for each participant was measured by an experimenter using a wall-mounted height meter and scale, respectively. The average weight of participants was 179.95 pounds ($SD = 43.86$) and the average Body Mass Index (BMI) of participants was 32.26 lb/in^2 ($SD = 7.26$, range: 19.37–60.10). Each participants' BMI was calculated using the height and weight measurements collected by the experimenter, and each BMI score was assessed according to guidelines set forth by the National Institutes of Health (2013).

Procedure

Participants completed an online prescreen assessment. As part of the departmental prescreen assessment, participants completed a measure of their perceptions that they experience discrimination based on their weight (i.e., perceived weight stigma). During the laboratory portion of the study, participants arrived at the laboratory where an experimenter greeted them and explained that they would participate in three separate tasks designed to assess cognitive processing. After providing informed consent, participants completed the study tasks.

First, participants were randomly assigned to read either an article describing workplace discrimination against individuals with higher body weight or workplace discrimination against a self-irrelevant out-group (i.e., Inuit Canadians) (see Appendix A). The articles discussed experiences of workplace discrimination against individuals with higher body weight (*weight discrimination condition*) or against Inuit Canadians (*control condition*). Examples of excerpts from each article include: "Compared to [average weight individuals/ White Canadians] doing the same job, [overweight individuals/Inuit Canadians] often earn

[1]The interest of this study was perceived weight stigma and it was not expected that there would be differences between females and males in the extent to which perceptions influenced outcomes. Although the threshold at which weight stigma may be perceived is likely different for women than men, once an individual does perceive weight stigma, the consequences should theoretically be the same regardless of gender. To assess the potential that there were differences between females and males in perceived weight stigma, male participants were removed from the regression analyses to examine the patterns of association in females only. After removing males from the analyses, the interaction effects of perceived weight stigma and weight discrimination salience on both inhibitory control and calorie selection remained consistent with those observed using the full sample. Other research does support that although there are gender differences in perceived weight stigma and discrimination, the relationship between weight stigma and relevant outcomes remains consistent regardless of gender (Hunger & Major, 2015).

less" and "According to research findings from Stanford University, [overweight individuals/ Inuit Canadians] are 71% more likely to remain in a job without any promotion for five years or more compared to their [average weight/White Canadian] counterparts." Similar procedures have been used previously to experimentally manipulate perceived stigma (e.g., Major et al., 2014; McCoy & Major, 2007; Wilkins, Wellman, Babbitt, Toosi, & Schad, 2015).

Following the article manipulation, participants completed an adaptation of the Parametric Go/NoGo task as described by Langenecker, Zubieta, Young, Akil, and Nielson (2007) to assess inhibitory control. This task involved viewing letters on a screen and either pressing the spacebar or inhibiting pressing the spacebar in response to particular target letters. The task included two sets of three different levels assessing attention, set-shifting, and processing speed, with the last two more difficult levels assessing inhibitory control (Langenecker et al., 2007). In the first set, participants kept track of two letters. In the second set, participants kept track of three letters. Participants viewed a stream of letters presented quickly on a white background and were instructed to press the spacebar with either thumb to respond to certain target letters or not press the spacebar to inhibit their responses to the target letters. In the first set, participants pressed the space bar to respond to the letters "r" and "s" (Level 1), to inhibit their response to "r" and "s" when either letter appeared consecutively (Level 2), and to inhibit their response to "r" and "s" when they were immediately followed by a red stop sign (Level 3). In the second set, participants responded to the letters "r," "s," and "t" using the same rules as each level in the first set.

After completing the inhibitory control task, participants completed a food choice task to measure behavioral intent with regard to eating. This task required participants to choose from a menu any food items they would like to eat in an imagined scenario. Participants were instructed to imagine that they were going to dinner with a friend at an American-style sit down restaurant. They were instructed to choose items that they personally would like to eat in the imagined scenario and click those items on the interactive menu (Brochu & Dovidio, 2014; adapted from Liu, Roberto, Liu, & Brownell, 2012). Participants could select anything they would want to eat at dinner, including but not limited to appetizers, main courses, desserts, and beverages.

Finally, the experimenter took various anthropometric measurements for each participant and then provided them with a gift card or granted them course credit. Before leaving the laboratory, participants were probed for suspicion, thanked, and debriefed.

Measures

Prescreen Measures

Perceived Weight Stigma: A 5-item composite was used to measure perceived experiences with weight discrimination. Similar items have been used in previous studies (see Wellman et al., 2017). Participants indicated on a scale of 1 (*strongly disagree*) to 7 (*strongly agree*) their level of agreement with the following statements regarding their experiences with weight stigma: "I feel like I am personally a victim of society because of my weight," "I consider myself a person who is deprived of opportunities that are available to others

because of my weight," "I experience discrimination because of my weight," "I personally have been a victim of weight discrimination," and "I have felt that people have lower expectations of me because of my weight," α = .89, *M* = 3.40, *SD* = 1.60[2].

Experimental Measures

Inhibitory Control: Response inhibition was measured as a percentage of correct trials by dividing the correct number of inhibitory trials by the total number of potential inhibitory trials for each level (Langenecker et al., 2007). The final score used as the dependent variable for each participant was an average of the third level (i.e., stop sign level) of both the first and second sets (*M* = 20.48; *SD* = 7.68), as the third level is thought to more clearly distinguish inhibitory control and to reflect sensitivity in detecting differences in young, healthy populations (Langenecker et al., 2007).

Food Selection: The total number of calories ordered on the food selection task (Brochu & Dovidio, 2014) was used as the measure of food selection in the present study. Participants viewed an online menu without calorie information and selected the items they would like to order. Each item was representative of a certain number of calories and the calories for each item were recorded when participants made their selection(s). The total number of calories chosen by each participant was summed for each individual (*M* = 2,361.96; *SD* = 1,333.84).

Descriptive statistics by condition and Pearson product-moment correlation coefficients were computed for all variables and are presented in Table 1.

Results

Analysis Strategy

To test the interaction hypotheses in the present study, a hierarchical linear regression was conducted on each dependent variable (i.e., inhibitory control and food selection). The main effects of perceived weight stigma (mean-centered) and article condition (0 = weight discrimination) were entered in Step 1 and the two-way interaction was entered in Step 2[3]. PROCESS (Model 8; Hayes, 2013) was used in SPSS to test the moderated mediation hypothesis. Both indirect and direct effects were examined based on 10,000 bootstrapped samples, and a 95% bias corrected confidence interval was used as the index for moderated mediation. A confidence interval that does not include zero indicates a significant effect. Below, the focus is on the highest order effect for each analysis. The full regression output is included in Table 2.

Inhibitory Control—As predicted, there was a significant two-way interaction between perceived weight stigma and article condition in predicting percentage of correct trials on

[2]There was a significant difference in perceived weight stigma, such that individuals in the control condition were higher on this measure than individuals in the experimental condition. Considering that perceived weight stigma was assessed prior to the manipulation, it could not be attributed to the manipulation. This difference in the control condition makes it more difficult to have found an effect and the observed interactions. The current findings, however, cannot be attributed to this group difference.

[3]Body mass index (BMI) was entered into Step 1 of two regression analyses as a predictor of inhibitory control and number of calories selected on the menu task. BMI was not a significant predictor of either outcome, and as such was dropped from subsequent analyses. Similarly, age was examined as a predictor of inhibitory control and food selection and was not significant, thus dropped from subsequent analyses.

the inhibitory control task, Step 2: $F(3, 80) = 3.19$, $p = .03$, $\Delta R^2 = .08$; Model: $R^2 = .11$, $F(1, 80) = 6.71$, $p = .01$ (see Figure 1).

Specifically, in the *weight discrimination* article condition, greater perceived weight stigma was associated with decreased performance on the inhibitory control task: $b = -2.43$, $SE = .82$, $t(80) = -2.96$, $p = .004$. In the *control* article condition, perceived weight stigma was unassociated with inhibitory control: $b = .33$, $SE = .68$, $t(80) = .49$, $p = .63$.

Food Selection—As predicted, there was a significant two-way interaction between perceived weight stigma and article condition in predicting food selection (i.e., number of calories ordered), Step 2: $F(3, 80) = 2.91$, $p = .04$, $\Delta R^2 = .05$; Model: $R^2 = .10$, $F(1, 80) = 4.24$, $p = .043$ (see Figure 2).

Specifically, in the *weight discrimination* article condition, perceived weight stigma was associated with increased number of calories ordered: $b = 419.85$, $SE = 143.10$, $t(80) = 2.93$, $p = .004$. In the *control* article condition, perceived weight stigma was unassociated with number of calories ordered on the food selection task: $b = 37.37$, $SE = 118.46$, $t(80) = .32$, $p = .75$.

Moderated Mediation

There was no evidence of moderated mediation. The mediational paths from perceived weight stigma to number of calories ordered on the food selection task via inhibitory control were not significant in either of the two conditions, and they did not differ from one another as indicated by the index of moderated mediation (including zero in the 95% confidence interval), $b = -31.30$, 95%, CI: [−149.96; 49.10]; Model: $R^2 = .10$, $F(4, 79) = 2.25$, $p = .07$.

Discussion

Although a majority of Americans have high body weight, weight stigma is still prevalent throughout society. The current research sheds light on how weight stigma impacts cognitive function and eating behavior by demonstrating that when participants were primed with discrimination against their group, those who were higher in perceived weight stigma (i.e., increased perceptions of being discriminated against based on their weight) performed more poorly on the inhibitory control task and ordered more calories on the food selection task. There was no relationship between perceived weight stigma and inhibitory control or food selection when individuals did not read about discrimination against individuals with higher body weight. The finding that perceived weight stigma and weight discrimination salience interacted to negatively impact both inhibitory control and calories ordered provide further evidence that weight stigma can both impair cognition and increase calorie consumption.

The current findings imply that it is not necessarily one's perceptions or experiences of weight stigma alone that matter but, rather, how they interact with the situation that may be driving the impact on cognition and eating behavior. Both perceived weight stigma and the saliency of weight-based discrimination seem to be important determinants of the extent to which weight stigma impairs cognitive functioning and increases calorie selection. In other words, whether a person is high or low in perceived weight stigma will not necessarily

influence cognition or behavior unless weight-based discrimination is made salient, indicating that perceived weight stigma in general may only function in particular contexts. Previous research has shown that weight-based discrimination can lead to several negative outcomes across a wide array of psychological and physical domains (e.g., Almeida et al., 2011; Major et al., 2012; Wott & Carrels, 2010). The present study, however, adds to the understanding of these relationships by highlighting the importance of both perceived stigma and situational saliency, in conjunction with one another, in predicting cognitive and behavioral outcomes.

It is also the case that the present findings provide novel information about the effects of perceived stigma within the realm of weight. Researchers have manipulated the salience of weight stigma (e.g., Major et al., 2012) or measured constructs that may act as proxies for weight stigma (e.g., perceived weight status; Major et al., 2014), but the present study directly measured perceived weight stigma in context, thereby demonstrating the importance of this construct for cognitive and behavioral outcomes when weight discrimination is made salient.

One major strength of the present study is that the majority of the sample was non-White. Research on weight stigma and its impacts on cognitive and behavioral outcomes is often conducted using White women as participants. In the present study, only 8% of the sample identified as White. Although, similar to previous work, the present sample consisted of mostly females (76%), uniquely it consisted of 68% Hispanic or Latina/o participants. According to a recent report by the Pew Research Center, the Latina/o population accounted for over half of the population growth in the United States between 2000 and 2014 and this group has consistently remained one of the top two fastest growing racial groups in the United States (Stepler & Lopez, 2016). In 2014, the prevalence of obesity was 42.5% for Hispanic adults in the United States, compared to 34.5% for White adults (Ogden, Carroll, Fryer, & Flegal, 2015). As recent as 2014, the percentage of adults who are overweight or obese among this population is the highest in the country, and the percentage of adults with higher grades of obesity (i.e., BMI > 30) among this population is either the highest or second highest in the country (National Center for Health Statistics, 2015). Given that individuals higher in body weight often experience weight stigma to a greater extent, it is a problem that almost all studies examining weight stigma use mostly White samples. That the present sample is primarily Latina/o provides novel, much needed information about the impact of weight stigma on cognitive and behavioral outcomes in this population. The present findings indicate that weight stigma outcomes in Hispanic or Latina/o individuals are similar to those among White individuals. Results of this study offer important insights into understanding weight stigma and its impact on cognition and eating behavior among a less frequently studied population. Thus, the present study contributes substantially to the literature by addressing a critical gap in overall understanding of how weight stigma impacts non-White individuals.

Results from the current study suggest some potential explanations for the observed effects of weight stigma. For example, participants in the weight discrimination condition were likely threatened by the article task, which could have negatively impacted executive functioning, subsequently leading to poorer performance on the measure of inhibitory

control and more calories ordered on the food selection task. Research suggests that stereotype threat and its related outcomes may be mediated by different executive functions. Rydell, Van Loo, and Boucher (2014) showed that women under stereotype threat exhibited reduced inhibition and poorer updating, both basic elements of executive control. This explanation is also consistent with previous literature showing stigmatization and stereotype threat are associated with a reduction in cognitive abilities (Brochu & Dovidio, 2014; Major et al., 2012). In the present study, reduced inhibition following threat could explain why weight stigma exerted a negative impact on cognitive performance. The subjective perception of weight stigma and the objective saliency of weight discrimination together may have reduced the inhibition necessary for participants to perform well on the inhibitory control task and to control their choices on the food selection task, resulting in poorer cognitive performance and more calories selected when weight stigma was made salient.

The interaction effect of perceived weight stigma and the saliency of weight-based discrimination on number of calories ordered further supports a previously proposed pathway through which weight stigma may actually lead to increased weight gain: increased eating, as proposed by the cyclic obesity/weight-based stigma (COBWEBS) model (Tomiyama, 2014), which describes how weight stigma begets further weight stigma through increased eating and weight gain. In the present study, higher levels of perceived weight stigma were associated with an increased number of calories selected when individuals were reminded about discrimination against their in-group. Although the focus was on calorie ordering in the present study, this is likely to be indicative of actual food consumption. Past researchers have utilized related methods; instructing participants to order food items and then providing the actual food items for participants to eat (Guendelman, Cheryan, & Monin, 2011). Participants were inclined to eat the food, suggesting their intentions on the ordering task did translate to actual eating behavior (Guendelman et al., 2011). Thus, the present findings suggest support for the COBWEBS model, providing further evidence for the association between weight stigma and increased eating behavior. Additionally, the present findings add nuance to the model by identifying the importance of both perceived weight stigma and weight discrimination together in predicting eating behaviors.

There are a number of potential reasons why inhibitory control may not have mediated the relationship between perceived weight stigma and number of calories ordered in the present study. It simply may be that the present study was underpowered to detect a moderated mediation effect. Although the present sample was sufficient to support the primary analyses, it may have been inadequate for reliably testing a more complicated model such as this. It is also possible that inhibitory control may be more predictive of calorie selection and consumption when actual food is present. Although previous research has identified a link between inhibitory control and eating (Houben, 2011; Jasinska et al., 2012), these studies often use behavioral measures of eating, such as total number of calories or grams consumed (Houben, 2011). In the present study, the outcome variable was the total number of calories ordered on a menu task that involved an imagined scenario in which the participant was at dinner with a friend. Although ordering food is an oft-used proxy for food consumption, real-world contextual cues may improve the association between ordering and eating, thus the relationship between inhibitory control and eating may be more pronounced when examined in a real-world eating situation. Additionally, it may be that there are different

elements of executive function through which weight stigma acts on inhibitory control and regulation of eating. There are many cognitive processes thought to underlie executive functions, including inhibition, attention, and working memory (Alvarez & Emory, 2006). Inhibitory control and food selection may be directed by different underlying processes, which could explain why in the present study weight stigma significantly impacted inhibitory control and calorie selection, but an association between inhibitory control and calorie selection was not observed. For example, emotional distress in response to weight stigma might explain why in the present study weight stigma impacted inhibitory control and food selection, but inhibitory control and food selection were not associated with one another. It is possible that weight stigma was emotionally distressing to participants, which led to an increased number of calories selected on the menu task, as previous research has shown that weight stigma can be stressful and is related to maladaptive eating patterns (e.g., see Tomiyama, 2014 for a review).

Limitations and Future Directions

One opportunity for expansion of the present findings is to investigate the role of other cognitive processes in the relationship between weight stigma and eating behavior. Here, inhibitory control was examined, but decreased executive control in general can also result from a fear of being stigmatized based on one's weight (Major et al., 2012). Future studies could examine a longer list of relevant executive functions (e.g., goal-directed persistence, attention) to determine if they have any role in self-regulating eating behavior following weight-based discrimination. Additionally, weight-based discrimination is stressful (Tomiyama, 2014). Stress has been suggested to deplete cognitive resources needed for self-regulation among women with higher body weight (Major et al., 2012) and could lead to unhealthy eating (Groesz et al., 2012). Because stress was not assessed in this study, and thus cannot be examined as a possible mechanism, future studies could examine the role of stress in the relationship among weight stigma, discrimination salience, inhibitory control, and eating. There are also limitations regarding the food selection task, as particular variables that may have been relevant to participant responses were not assessed. For example, time since last meal, hunger levels during the task, and dieting efforts were not measured or controlled for in this study, although it was the case that there were relatively equal numbers of participants in each condition throughout each day of data collection. Still, future studies could measure and control for such variables.

Finally, an important limitation of the present study was the small number of male participants, compared to female participants. As is typical of studies examining weight stigma, this sample was primarily female. In the weight stigma literature in general, males are substantially underrepresented, which presents a significant challenge for weight stigma researchers in understanding how weight-based stigma and discrimination, perceived or experienced, impact men. In future studies, attempts could be made to find ways of recruiting more balanced samples or increasing the number of males who participate in weight stigma studies. Particularly because weight stigma and weight discrimination are problematic, frequently-studied social issues today, identifying the ways in which the perceptions and experiences of weight stigma affect cognition and behavior in men is

crucial. Future studies may try to recruit only male participants or to collect data for longer periods of time so as to obtain enough male participants to extract informative findings.

Implications and Conclusions

It is becoming increasingly clear that weight stigma has implications for both cognitive function and eating behavior. The present findings build upon previous literature to identify particular instances in which these relationships might be observed. Specifically, these findings offer critical information about how and in what ways the perception and saliency of weight stigma interact to impact cognitive and behavioral outcomes. Identifying the importance of the interaction between perceived weight stigma and the salience of weight discrimination illuminates several potential directions for future research and intervention efforts, as well as for reducing the negative impact of weight stigma on individual health outcomes. It may behoove researchers, clinicians, and individuals to try to stave off the negative consequences of weight stigma at either or both the individual and societal levels, although change at the individual level has the potential to be enacted more quickly. As such, this information provides useful insights into ways of combatting the effects of weight stigma (e.g., perception-focused therapy interventions).

Broader implications of this research include a greater understanding of the consequences of weight-based discrimination for both cognition and eating, which is particularly important, as shortages of research and policies regarding weight stigma have allowed for negative attitudes about weight to persist to the point that weight-based discrimination is still considered an acceptable form of discrimination (Andreyeva, Puhl, & Brownell, 2008; Puhl & Brownell, 2001). Research into the negative consequences of weight stigma for eating is also particularly crucial to society and the health care system because many campaigns designed to foster weight loss use stigmatizing weight-related language to motivate individuals to lose weight or eat healthfully (e.g., Callahan, 2012; Strong4Life campaign).

Although stigmatizing methods are used frequently to promote health behavior change, research and psychological theory suggest this is a counterproductive strategy (Puhl, Moss-Racusin, & Schwartz, 2007; Tomiyama, 2014). The present findings contribute to a greater awareness of the consequences of societal bias against individuals with higher body weight, as well as advance our theoretical understanding of weight stigma and provide meaningful insights for addressing weight loss (e.g., reducing the stigmatization of weight). Moreover, these and other related findings provide further support for the notion that the use of stigmatization as a motivator is not conducive to changing behavior, and can actually be harmful to the psychological and physical health well-being of individuals.

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Appendix A Weight Stigma Manipulation Article

Workplace Discrimination is Alive and Well

It is customary to assume that individuals who perform the same job function with the same qualification should be paid the same wage. Unfortunately, this is not always the case for certain groups of individuals working in the [United States/Canada]. In particular, [overweight/Inuit Canadians] are often treated unfairly in the workplace. Compared to [average weight individuals/White Canadians] doing the same job, [overweight individuals/Inuit Canadians] often earn less, are promoted less frequently, and receive fewer rewards for a job well done.

In a recent study, economists at the University of Texas at Houston collected data from individuals including [body measurements/ethnicity] and salary at their current job. Researchers were interested in examining possible differences in pay based on [weight status/ethnicity]. Results of the study showed that [overweight individuals/Inuit Canadians] received .70 cents for each dollar made by [average weight individuals/White Canadians].

According to research findings from Stanford University, [overweight individuals/Inuit Canadians] are 71% more likely to remain in a job without any promotion for five years or more compared to their [average weight/White Canadian] counterparts. These findings held even when controlling for education, experience, and performance evaluations. Additionally, [overweight individuals/Inuit Canadians] reported receiving fewer rewards and less praise from employers and supervisors than [average weight individuals/individuals who identified as White].

In addition to difference in pay and promotion, there are also disparities in the hiring process itself. [Overweight individuals/Inuit Canadians] are also less likely to be hired for a job when it requires an in-person interview or computer-televised interview via Skype. They are equally as likely to be hired for a job when the interview is over the phone where [weight/ethnicity] is not visible. Research from the University of Washington, Seattle found that when employers conducted interviews over the phone, [overweight individuals/Inuit Canadians] were equally as likely to be hired as [average weight/White Canadian] applicants with similar qualifications. However, when interviews were done in person or via Skype, [overweight/Inuit Canadian] applicants were four times more likely to be turned down for a job, even when their qualifications were comparable or slightly better than their [average weight/White Canadian] competition.

Considering the pervasiveness of employment-related discrimination against [overweight individuals/Inuit Canadians], there is a need for a solution to the problem. If these individuals are being paid a lower wage, passed over for promotion, and rewarded and praised less often, consequences for their careers and overall well-being are serious. Stereotypes about [the overweight/Inuit Canadians] (e.g., [lack of control, lazy/uneducated, lazy]) can create problems for these individuals, and although discrimination toward many minority groups appears to be declining, discrimination toward [overweight individuals/Inuit Canadians] is on the rise. Little has been done to address issues of discrimination in the hiring process and workplace for these individuals and, if left unchecked, this discrimination

will continue to negatively impact the opportunities and outcomes of [the overweight/Inuit Canadians].

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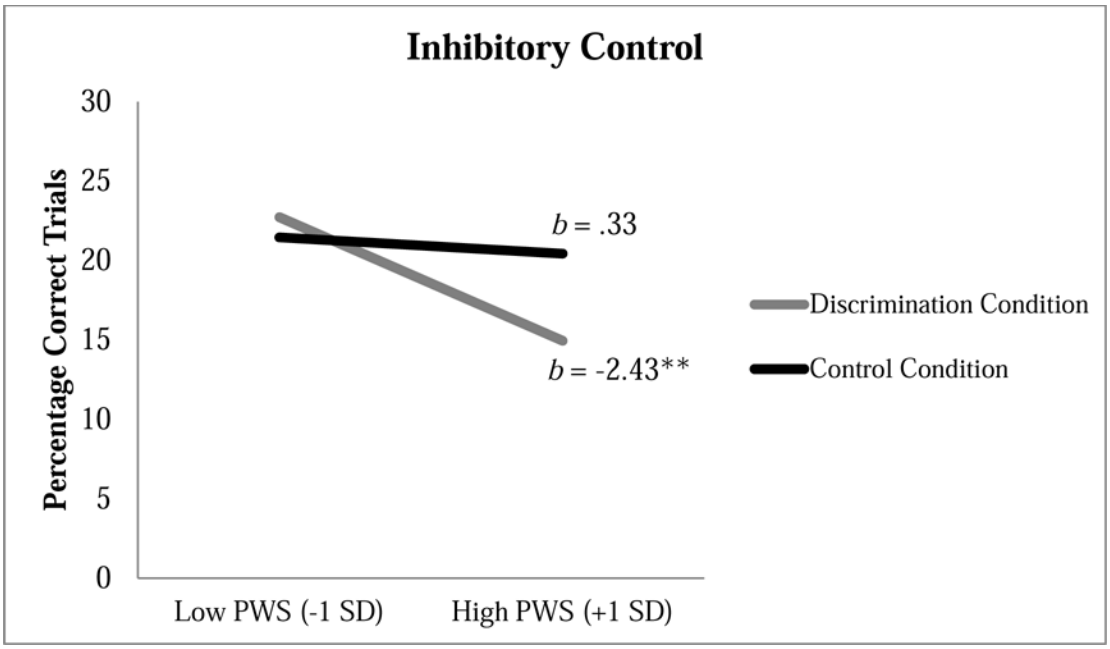

Figure 1.
Perceived weight stigma predicts inhibitory control by condition.
Note: *$p < .05$, **$p < .01$

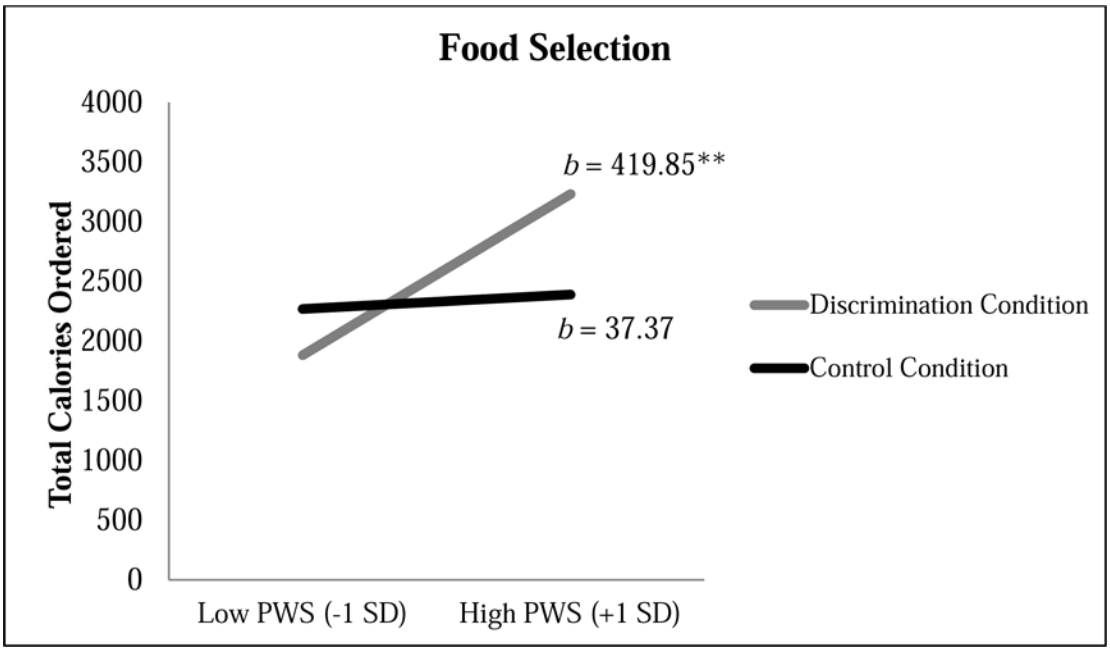

Figure 2.
Perceived weight stigma predicts food selection by condition.
Note: *$p < .05$, **$p < .01$

Table 1

Descriptive statistics and correlations among variables by article condition.

	1	2	3	4	5	*M*	*SD*
1. PWS		−.42**	.40**	.44**	−.12	2.91	1.43
2. Inhibitory Control	.08		−.21	−.04	.08	19.85	8.28
3. Food Selection	.05	−.07		.21	−.20	2381.22	1486.48
4. BMI	.35*	.01	.14		−.16	31.80	8.59
5. Age	−.09	−.00	.06	.18		21.44	5.24
M	3.77	21.09	2343.60	32.70	21.40		
SD	1.68	7.11	1187.76	5.80	5.57		

Note: Pearson Product-Moment Correlations (R) are presented. PWS = Perceived Weight Stigma, BMI = Body Mass Index; Correlations appearing above the diagonal represent the weight discrimination article condition, Correlations appearing below the diagonal represent control article condition; Means and Standard Deviations for each measure appearing above the diagonal represent the weight discrimination article condition ($n = 41$), Means and Standard Deviations for each measure appearing below the diagonal represent the control article condition ($n = 43$);

* $p < .05$

** $p < .01$

Table 2

Regression output for dependent variables.

Dependent Variable	Inhibitory Control			Food Selection		
	b	**SE**	**ΔR^2**	***b***	**SE**	**ΔR^2**
Step 1:			.03			.05
PWS	−.79	.54		192.89*	93.06	
Article (0 = WD)	1.88	1.73		−193.13	296.81	
Step 2:			.08*			.05*
PWS X Article	2.76**	1.07		−382.48*	185.77	

Note: PWS = Perceived Weight Stigma, WD = Weight Discrimination;

*$p < .05$

**$p < .01$