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Abstract

The authors theorized that overweight individuals experience social identity threat in situations that activate concerns about weight stigma, causing them to experience increased stress and reduced self-control. To test these predictions, women who varied in body mass index (BMI) gave a speech on why they would make a good dating partner. Half thought they were videotaped (weight visible); the remainder thought they were audiotaped (weight not visible). As predicted, higher BMI was associated with increased blood pressure and poorer performance on a measure of executive control when weight was visible and concerns about stigma were activated but not when weight was not visible. Compared to average weight women, overweight women also reported more stress-related emotions when videotaped versus audiotaped. Findings suggest that weight stigma can be detrimental to mental and physical health and deplete self-regulatory resources necessary for weight control.

Keywords

stigma, obesity, self-regulation, identity threat, stress, prejudice

Stigmatization of overweight and obese individuals in the United States is both profound and increasing (Andreyeva, Puhl, & Brownell, 2008; Puhl & Heuer, 2010). Overweight individuals are negatively stereotyped as lazy, weak willed, and self-indulgent, and are devalued and discriminated against by classmates (Latner, Stunkard, & Wilson, 2005), parents (Crandall, 1995), health care workers (Hebl & Xu, 2001), store clerks (King, Hebl, & Heatherton, 2005), coworkers and managers (Larkin & Pines, 1979), and even by other overweight individuals (Crandall, 1994). Although a substantial amount of research has demonstrated the pervasiveness of weight stigma, far less has examined its psychological or physiological effects. Extant research has primarily documented the extent to which overweight people report being victims of weight-based discrimination and correlates of this perception (e.g., Carr & Friedman, 2005; Puhl, Andreyeva, & Brownell, 2008).

We propose that weight stigma is identity threatening for overweight individuals, triggering a cascade of negative emotions, cognitions, behaviors, and biological responses. In the current research, we test the hypotheses that situational cues that make concerns about weight stigma salient lead to increased stress among overweight individuals, as indexed by psychological and cardiovascular (CV) responses, and also disrupt self-regulatory processes important for self-control. Two major contributors to increased eating are known to be inefficient self-regulation and increased stress (Adam & Epel, 2007).

Weight Stigma and Identity Threat

Contemporary models of stigma propose that contexts which trigger concerns about confirming negative stereotypes or being a target of prejudice are threatening to people's sense of self-integrity (see Major & O'Brien, 2005, for a review). *Social identity threat* describes the psychological state that occurs in situations where people feel at risk of being devalued because of their social identity or judged through the lens of negative stereotypes (Steele, 1997; Steele, Spencer, & Aronson, 2002). Identity-threatening situations are assumed to be stressful, triggering involuntary physiological, cognitive, emotional, and behavioral reactions. To cope with these stress reactions and successfully negotiate threatening interactions, stigmatized individuals engage in self-regulatory efforts, such as trying to suppress negative cognitions and emotions (e.g., Johns, Inzlicht, & Schmader, 2008) or engaging in behaviors to overcome negative stereotypes (e.g., Miller, Rothblum, Felicio, & Brand, 1995; Shelton, Richeson, & Salvatore, 2005).

These coping efforts are costly. According to limited resource models of executive attention, when an individual engages in a task that requires self-regulation or control, his or her executive attentional capacity is temporarily depleted, leading to impaired performance on subsequent tasks that also require executive control (Muraven & Baumeister, 2000). For example, dieters instructed to suppress their emotions while watching a sad movie, a task that requires self-control,

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subsequently ate more ice cream than dieters who were not asked to suppress their emotions (Vohs & Heatherton, 2000). Likewise, contending with identity-threatening situations has been shown to deplete executive attentional capacity and impair performance on subsequent tasks requiring executive control (e.g., Inzlicht & Kang, 2010; Johns et al., 2008; Richeson & Trawalter, 2005).

The current research extends this identity-threat approach to the understudied domain of weight stigma. Weight stigma differs in key ways from stigma associated with social identities like race, ethnicity, or gender, the primary focus of past research on social identity threat (Shapiro, 2011). First, weight is widely perceived as controllable, thus people often hold others (and themselves) responsible for having this social identity despite the fact that for most, efforts to lose weight are unsuccessful in the long term (Mann et al., 2007). Second, the social identity of being overweight is often acquired later in life, thus people typically have had years to learn negative stereotypes associated with being overweight and to devalue people who are overweight before this identity becomes personally relevant. Third, rather than being shared, celebrated, or embraced by close others such as family and friends, being overweight is often stigmatized and shamed by those very individuals (Crandall, 1994). As a consequence, unlike social identities such as race, ethnicity, or gender, overweight individuals often endorse negative stereotypes associated with overweight as legitimate and true of themselves as well as others, and typically do not have a strong sense of identification with the ''group'' overweight (Crandall, 1994; Shapiro, 2011). Indeed, rather than strongly identifying with or expressing pride in an overweight identity, most seek to escape it.

According to the Multi-Threat Framework of Stereotype Threat (Shapiro & Neuberg, 2007), as a consequence of their lower group identification, overweight individuals are less vulnerable than individuals with ''tribal stigmas'' like race or ethnicity, to experience *group-related* threats, such as fears of confirming in their own or others' eyes a negative trait as true of the group. However, because of their higher stereotype endorsement, they are more vulnerable to experiencing *self-concept-related* threat, a fear of confirming negative stereotypes in their own eyes. In addition, they are equally as likely as other stigmatized groups to experience *own reputation threat,* a fear that they will be judged by others in light of negative stereotypes associated with their identity. This latter type of threat is the most frequently experienced by stigmatized individuals (Shapiro, 2011). Finally, whereas social norms prohibit expressing overt prejudice and discrimination against people of different races, ethnicities, religions, or genders, no such norms exist with regard to the overweight. Thus, prejudice against the overweight is often blatant, and demeaning remarks are often justified as being ''for their own good.'' Consequently, we believe identity threat associated with weight stigmatization may be especially pernicious.

To our knowledge, the current research is the first to test an identity-associated process that may explain why weight loss can be so challenging. We propose that weight stigma itself leads to stress and self-regulatory depletion among overweight individuals, both of which can increase eating and undermine weight loss efforts.

We propose that for overweight individuals, situations in which appearance is important and salient activate concerns about being devalued, rejected, and/or negatively stereotyped because of one's weight. These situations, such as meeting new people, going on a date, interviewing for a job, or ordering food in restaurants, are identity threatening. The source of identity threat in these situations stems from the individual's awareness of his or her membership in an overweight category, as well as awareness of the stereotypes and devaluation associated with this category. We predict that interactions that activate weight-related identity threat increase stress among overweight individuals, as indexed by emotional and physiological responses, including increases in cardiovascular reactivity (CVR). We also predict that coping with the stress evoked by weight-related identity threat consumes cognitive resources and hence impairs performance on subsequent tasks requiring executive control (Johns et al., 2008; Richeson & Trawalter, 2005).

Both of these processes, in turn, can contribute to obesity as well as poorer health among overweight individuals. Physiological stress has been shown to affect the reward system that regulates eating and to increase the intake of palatable food among animals (Adam & Epel, 2007). Furthermore, frequent activation of physiological systems associated with stress can lead to cumulative wear and tear on the body that damages physical health (Adler & Snibbe, 2003). Elevated CVR in response to stressors, for example, has been shown to prospectively predict the development of cardiovascular disease (Matthews, Bump, Block, & Allen, 1997) and carotid atherosclerosis in adults (Kamarck et al., 1997). Some authors speculate that the stress resulting from weight stigma is a major cause of the association observed between obesity and disease, particularly since the desire to lose weight is an important predictor of weight-related morbidity, even when objective weight is held constant (Muennig, 2008). In addition, the self-regulatory demands of coping with identity threat can take a toll on physical health by exhausting the self-regulatory resources needed to implement healthy behaviors. Refraining from eating highly palatable food, maintaining an exercise program, or quitting smoking, for example, all require self-control (e.g., Inzlicht & Kang, 2010).

Overview and Predictions

In the current research, we asked women who varied in objective weight (body mass index, BMI) to give a speech about ''why they would make a good dating partner.'' Dating is a domain that is highly appearance relevant, thus we expected this context to activate identity threat among overweight women, especially when they believed their weight would be visible. Accordingly, we led half of the women to believe their speech was being videotaped (camera was visible), and the other half to believe it was audiotaped (camera was hidden).

We hypothesized that the presence of a camera during the speech, by making weight visible, would make the situation more identity threatening for overweight women than for average weight women. In contrast, we expected the impact of objective weight to be attenuated in the absence of the camera, when weight was not visible.

To assess stress, we measured self-reported stress emotions (e.g., anxiety) experienced during the speech. We also assessed increases in CVR, specifically increases from baseline in mean arterial blood pressure (MAP) during the speech. Blood pressure (BP) reactivity is a commonly used measure of stress that has been reliably and prospectively linked to negative health outcomes (Chen & Matthews, 2003). To assess cognitive resource depletion, we measured performance on the Stroop color-naming task completed just after the speech ended. The Stroop is a reaction-time task that requires people to inhibit an automatic reading response to state the color in which a word is printed, a task that requires executive attentional control (Inzlicht, McKay, & Aronson, 2006).

We predicted that compared to women in the other conditions, overweight women in the videotaped condition would evidence greater increases in BP, show greater cognitive interference on a stroop task, and retrospectively report feeling more stress-related emotions during the speech. We used only women in our sample because weight stigma affects women more than men and at lower levels of weight (Azarbad & Gonder-Frederick, 2010).

Method

Participants

Ninety-nine women (age: $M = 18.83$ years, $SD = 1.33$, 77% White, 23% Latina) participated for partial course credit or for pay. For both theoretical and pragmatic reasons, only women who selected a response of 4 or greater during pretesting in response to the question, ''How would you describe your body size?'' on a scale from 1 (*very underweight*) to 7 (*very overweight*) were invited to participate. Over 78% of available respondents met this inclusion criterion. At the conclusion of the experiment, all participants were weighed and measured for height. We calculated BMI as, (weight in pounds $\times$ 703)/(height in inches). Participants' average BMI was 27.40, $SD = 5.64$, with a maximum BMI of 44.22 and a minimum BMI of 19.63. According to weight standards established by the World Health Organization, 38% of our participants were average or ''normal'' weight (BMI 18.5–24.99), 35% were overweight (BMI 25–30) and 26% were obese (BMI >30).

Procedure

Arrival and baseline measurements. Participants arrived at the laboratory where a female experimenter informed them that the experiment involved ''first impressions between potential dating partners,'' and that they would give a speech imagining themselves in a dating situation.[1] After they consented to participate (all did), they changed into a white t-shirt so as to standardize the appearance across conditions. They then sat for 5 min while their baseline MAP was measured.[2]

Manipulation and speech. Depending on random assignment, participants were told that they would give either a video-taped or an audio-taped speech on ''why you would make a good dating partner.'' Those in the video-taped condition were made aware of the camera and asked to look directly at it while speaking. In the audio-taped condition, the camera was hidden and participants were asked to record their speeches into a microphone placed on the table. All participants were told that a videotape (or audiotape) of their speech would be given to male and female undergraduate research assistants who would rate how good a dating partner the participant would make. After the baseline period, participants were given 2 min to read instructions for the speech task. They then gave a 5-min speech. MAP was assessed throughout.

Measure of executive control. After the speech, the BP cuff was removed, and participants completed a Stroop color-naming task to measure cognitive depletion. Words were presented on a computer screen in congruent colored (the word red printed in red) and incongruent colored (the word red printed in blue) ink and the participant was asked to press a key on a keyboard to report the color (red, blue, green, or brown) in which the word was printed. Because reading is an automatic process and naming a color in which a word was printed is not, it takes cognitive resources to override the former automatic response. The task included 12 practice trials followed by five blocks of 12 trials each, for a total of 20 congruent, 20 incongruent, and 20 control trials (a series of Xs printed in color) in randomized order. Participants first viewed a fixation cross for 100 ms after which a word appeared on the screen and remained until the participant selected the correct key.

Postmeasures. Participants completed a questionnaire assessing their emotions during the speech, as well as a check on whether they recalled their visibility condition. The experimenter then asked participants whether they would consent to be weighed and have their height measured; all agreed. Subsequently, they were debriefed using a process debriefing and probed for suspicion. Participants in the audio condition were told that they were in fact videotaped, and all participants were given an opportunity to consent or refuse to have their data used. All participants agreed to the use of their data.

Measures

BP reactivity. Noninvasive recording of cardiac measures followed established guidelines (e.g., Sherwood et al., 1990) and used equipment in accordance with safety standards. Continual recordings of BP using tonometric technology was obtained from the radial artery of the nondominant hand using a Vasotrac (Model APM205A) BP monitor. Data were integrated with an MP150 and displayed and stored with Acknowledge software (Goleta, CA). We used Mindware software to edit artifacts and ensemble and score the CV data. We

calculated mean values of MAP reactivity by subtracting the last minute of the baseline period from each minute of the speech task. We then averaged all 5 min of the speech task to form a composite of MAP reactivity during the speech. These changes in BP served as our measures of physiological stress.

Stroop interference. Stroop latencies greater than 3 *SD* above the mean (times >1,406.23 ms) were recoded as 1,406.23 ms and latencies less than 3 *SD* below the mean (times <166.67 ms) were recoded as 166.67. One inconsistent trial had an overabundance of outliers (45 outliers/37% of the data for that trial) and thus was excluded from analyses.[3] The response latencies were then log transformed to reduce skewness, and thereby adhere to normality assumptions. Finally, a Stroop interference score was calculated by subtracting the average of the consistent trials from the average of the inconsistent trials. Higher values indicate more Stroop interference, that is, worse performance.

Stress emotions. Participants reported the extent to which they had felt the following emotions during the speech: nervous, overwhelmed, uncomfortable, and worried, each rated on 7-point scales. These were combined into a composite measure ($\alpha = .89$).

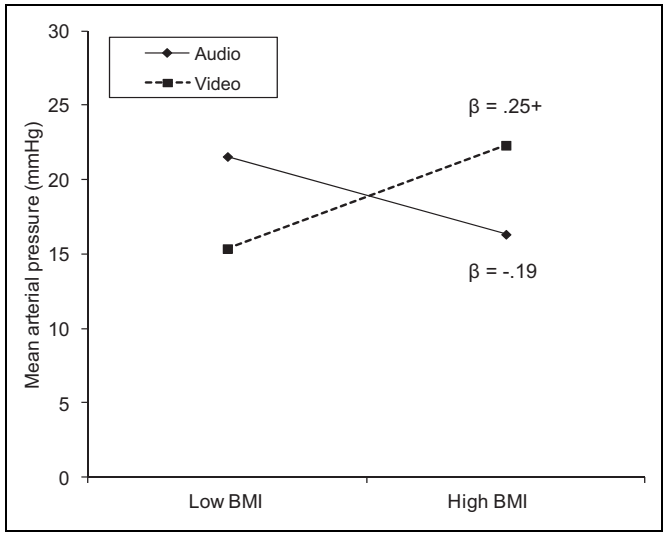

Figure 1. The impact of visibility condition and body mass index (BMI; plotted 1.25 standard deviations above and below the mean) on mean arterial pressure (MAP) during the speech, $+p = .070$.

Results

Analytic Strategy

Five people incorrectly identified the visibility condition they were in at the end of the study. These participants were excluded from analyses (results do not differ when they are included). We conducted hierarchical regression analyses to assess the influence of BMI and condition on the dependent variables. We entered BMI (centered) and visibility condition (dummy coded; 0 = *audio*, 1 = *video*) on Step 1. We entered the BMI × Condition interaction on Step 2. Because of different cultural norms surrounding weight for different ethnic groups (Crandall & Martinez, 1996), we also entered ethnicity as a covariate in Step 1. However, ethnicity was only a significant covariate in analyses of stress emotions; thus, we removed ethnicity as a covariate in the analyses of MAP and Stroop interference. Following standard practice (e.g., Seery, Blascovich, Weisbuch, & Vick, 2004), we entered baseline MAP on Step 1 as a covariate in analyses of MAP reactivity. Doing so accounts for any confounding effect magnitude of baseline values might have on magnitude of reactivity. BMI was unrelated to baseline MAP ($r = .027$, $p = .80$).

Physiological Stress

Baseline MAP predicted MAP reactivity ($\beta = -.23$, $p = .039$). No other main effects were significant. As predicted, BMI interacted with condition to predict MAP reactivity ($\beta = .34$, $p = .054$; $\Delta R^2 = .043$; see Figure 1). Among women who believed their weight would be visible to evaluators, and thus for whom concerns about weight stigma were activated, the more they weighed, the more their BP tended to increase during the speech, ($\beta = .25$,.$p = .070$). In contrast, among women who believed their weight would not be visible, BMI was unrelated to changes in MAP ($\beta = -.19, p = .29$). To further examine this interaction, we computed the difference between the two simple regression lines at one and a quarter standard deviations above (34.45) and below (20.36) the mean of BMI. We used one and a quarter standard deviations as a cutoff for theoretical reasons. Given that our inclusion criteria excluded underweight or very thin women, we wanted to compare women who clearly fell into the obese category with women who were at the lower range of the average weight category and thus would clearly not be perceived as overweight. Obese women tended to exhibit higher MAP in the video condition than in the audio condition ($\beta = .25$, $p = .15$). In contrast, slimmer women tended to exhibit higher MAP in the audio than the video condition ($\beta = -.28$ $p = .12$).

Stroop Interference

As predicted, BMI also interacted with visibility condition to predict depletion of executive control ($\beta = .37$, $p = .027$; $\Delta R^2 = .052$; see Figure 2). Among women in the videotape condition, the more they weighed, the worse they performed on the Stroop task ($\beta = .29$, $p = .025$). In contrast, BMI was unrelated to Stroop interference among women in the audiotape condition ($\beta = -.18$, $p = .29$). We also probed the interaction by computing the difference between the two simple regression lines at one and a quarter standard deviations above and below the mean of BMI. Obese women exhibited higher Stroop interference in the video condition than in the audio condition ($\beta = .32$, $p = .055$), whereas slim women tended to exhibit higher Stroop

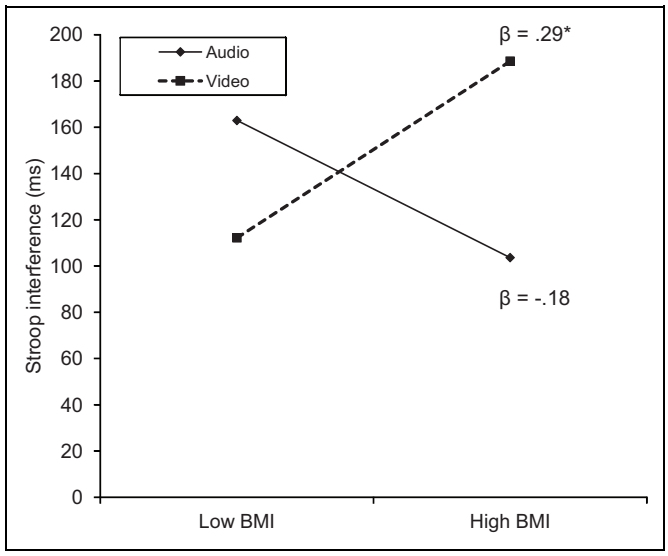

Figure 2. The impact of visibility condition and body mass index (BMI; plotted 1.25 standard deviations above and below the mean) on Stroop interference in milliseconds. *Note.* The Stroop latencies were log transformed for the reported analyses but are graphed in milliseconds for ease of understanding, *$p < .05$.

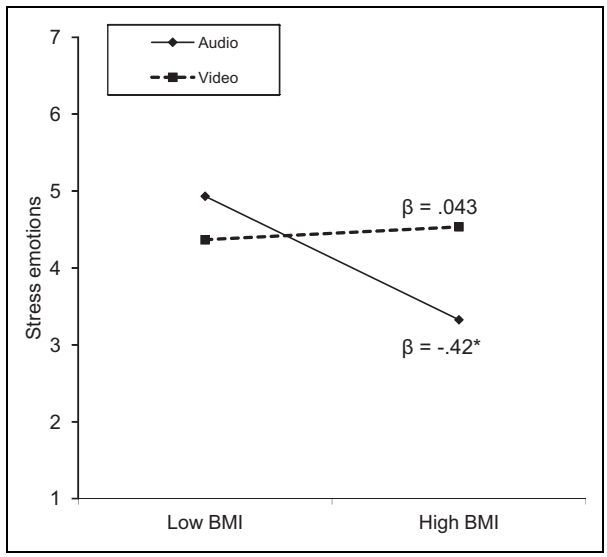

Figure 3. The impact of visibility condition and body mass index (BMI; plotted 1.25 standard deviations above and below the mean) on self-reported stress during the speech, *$p < .05$.

interference in the audio than the video condition ($\beta = -.26$, $p = .12$). No other effects were significant.

Stress Emotions

As predicted, BMI also interacted with condition to predict stress emotions ($\beta = .36$, $p = .024$; $\Delta R^2 = .050$; see Figure 3). The pattern of the interaction differed, however, from that for BP and executive control depletion. BMI was unrelated to stress-related emotions among women in the video condition ($\beta = .043$, $p = .74$) and was negatively related to stress-related emotions among women in the audio condition ($\beta = -.42$, $p = .011$). To further explore this interaction, we computed the difference between the two simple regression lines at one and a quarter standard deviations above and below the mean of BMI. As expected, obese women reported experiencing significantly more negative emotions in the video condition than in the audio condition ($\beta = .39$, $p = .016$). For obese women, the belief that their weight could not be seen decreased their feelings of stress compared to when they believed their weight could be seen. In contrast, stress emotions among slim women did not differ by condition ($\beta = -.18$, $p = .25$). We also observed a significant main effect for ethnicity, such that Latino participants reported feeling less stressed during their speech than White participants overall ($\beta = -.20$, $p = .052$).

Correlations Among Variables

Bivariate correlations revealed that increases in MAP during the speech were positively and significantly correlated with interference on the Stroop task after the speech ($r = .25$, $p = .025$). Correlations among the other dependent variables did not approach significance (all ps >.43).

Discussion

Although weight stigma in the United States and many other Western countries is pervasive, profound, and increasing, surprisingly little research has examined its psychological, physiological, or behavioral effects. Understanding these effects is important, given the growing number of individuals who are overweight or obese and thus exposed to weight stigmatization. We propose that overweight individuals are vulnerable to experiencing social identity threat in situations where they feel at risk of being devalued or discriminated against because of their weight or judged through the lens of negative stereotypes about overweight people. We predicted that weight-related identity threat would lead to increased stress and reduced executive control, both of which may contribute to weight gain and poorer health.

Consistent with predictions, we found that when women believed their weight would be visible to evaluators, the higher their BMI, the greater their stress reactivity, as indexed by increases in MAP from baseline. Furthermore, when they thought their weight was visible, the more overweight women were, the more cognitively depleted they were, as shown by impaired performance on a Stroop task following their speech. In contrast, BMI was unrelated to BP reactivity or cognitive depletion among who women thought their weight would not be visible to evaluators. Overweight women also reported experiencing more stress-related emotions when they thought their weight would be visible versus not visible, whereas average weight women's reports of stress did not vary by visibility condition. These results are consistent with our prediction that making weight visible activated identity threat associated with weight stigma among overweight women but not among average weight women.

Interestingly, whereas making appearance and weight visible (vs. invisible) in a dating context appeared to increase stress and deplete cognitive resources of obese women, it appeared to have the reverse effect on average weight women. Average weight women appeared to find giving a speech about why they would make a good date more stressful and more resource consuming when their weight and appearance was not apparent to evaluators than when it was apparent. This suggests that average weight women may regard their weight as an asset or resource that adds to their appeal as a dating partner; consequently, *not* having their weight visible makes the task more difficult and stressful for them. This suggestion is consistent with prior evidence that compared to less attractive women, highly attractive women are more likely to rely on their looks and less likely to be socially assertive in interactions where they know they can be seen (Miller et al., 1995; Reis et al., 1982).

It should be pointed out that because we were interested in identity threat associated with the stigma of obesity, we excluded from our study women who regarded themselves as underweight (21.6% of White and Latina women who responded to our prequestionnaire fell into this category). It is possible that these women would have experienced identity threat in the visible condition due to a fear of being judged in light of negative stereotypes associated with being thin. In our fat-phobic culture and especially in southern California where our research was conducted, however, being thin is typically highly valued. Hence, it is also possible that very thin women would not have experienced identity threat when visible. Because of this complexity in interpreting responses of self-perceived underweight women, limiting our sample to women who did not perceive themselves as underweight provided a cleaner and more straightforward test of our hypotheses.

It is also noteworthy that the effects reported here remain significant when we controlled for women's body dissatisfaction.[4] Because even average weight women in the United States tend to express high levels of body dissatisfaction (Cash & Henry, 1995), controlling for this variable allowed us to be more confident that the observed effects were associated with *own reputation threat*, that is, a fear of being judged negatively *by others* based on one's visible weight status. Not only did all significant effects reported here remain significant when body satisfaction was controlled for in analyses but some effects that were marginal, such as the simple slope of BMI on MAP in the visible condition, became significant ($p = .047$). Thus, even overweight women who are personally satisfied with their figure still show weight stigma threat effects under theoretically predicted eliciting conditions. These findings are consistent with the conceptualization of stereotype threat as a situationally activated "threat in the air" that affects stigmatized groups even if they do not share the culture's views of their stigma (Steele, 1997).

Implications

The current research provides support for recent claims that weight stigma may damage not only the mental health but also the physical health of overweight individuals (Muennig, 2008; Puhl & Huer, 2010; Schaefer & Ferraro, 2011). It also elucidates some of the mechanisms by which this may occur. Activating concerns about being devalued or stereotyped because of one's weight increases cardiovascular stress responses and negative stress-related emotions among overweight individuals. Increased stress, in turn, affects the reward system that regulates eating (Adam & Epel, 2007) and can lead to cumulative wear and tear on the body that damages physical health when stress is experienced repeatedly (Adler & Snibbe, 2003). Furthermore, the self-regulatory demands of coping with weight-related identity threats can exhaust the self-regulatory resources needed to exert self-control (Vohs & Heatherton, 2000). Self-control is essential to successfully manage weight, especially when palatable food is abundant and requirements for physical activity are few, as they are for most Americans. Thus, by depleting the very resources that overweight individuals need to control their weight and by increasing stress, exposure to weight stigma may ironically increase eating among overweight individuals (cf. Schvey, Puhl, & Brownell, 2011), thereby contributing to obesity and obesity-related health problems.

Declaration of Conflicting Interests

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Notes

1. BMI did not differ depending on whether participants were single or in a relationship, $t(95) = .41$, $p = .68$. Although insufficient power precluded including relationship status as a factor in the design, exploratory analyses including relationship status as a moderator revealed no systematic pattern in the impact of relationship status on the results.
2. MAP is the average pressure exerted upon the artery wall over a complete cycle of one heart beat. The pattern of results for the maximum arterial pressure (systolic BP) and the minimum arterial pressure (diastolic BP) were the same as the results for MAP.
3. The results remained the same whether or not the trial was excluded. Furthermore, the final Stroop interference score when the trial was excluded correlated highly with the final Stroop interference score when the trial was included ($r = .99$, $p < .001$).
4. We assessed body dissatisfaction several weeks prior to the study with 3 items (I am dissatisfied with my weight, I feel that I should lose weight, and I feel satisfied with my figure (reversed)). Body dissatisfaction was positively related to BMI ($r = .26$, $p = .013$) and negatively related to trait self-esteem ($r = -.23$, $p = .030$). Insufficient power precluded including body dissatisfaction as a

factor in the design. Exploratory analyses, however, revealed that it did not interact with BMI or visibility condition to affect any of the reported results.

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Bios

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