Original Article
CLINICAL TRIALS AND INVESTIGATIONS

Obesity

Putting on Weight Stigma: A Randomized Study of the Effects of Wearing a Fat Suit on Eating, Well-Being, and Cortisol

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Objective: Although a considerable amount of research has revealed connections between weight stigma and mental and physical health outcomes, no studies to date have experimentally manipulated the experience of obesity to understand how weight stigma causally affects eating behavior, physiology, and psychological well-being. Research has also not yet identified effective strategies for reducing weight stigma.

Methods: In this research, the effect of weight stigma on psychological outcomes, unhealthy eating behavior, and the stress hormone cortisol was examined by randomly assigning participants to appear obese by wearing a fat suit or not. It was hypothesized that the physical alteration of participants' apparent body size would lead to similar consequences as those associated with the experience of weight stigma and reduce antifat attitudes.

Results: Supporting these hypotheses, experimentally manipulating apparent body size led participants to consume more unhealthy foods and report higher levels of negative effect. However, the study did not show any differences in cortisol reactivity or reduction in antifat attitudes as a function of the fat suit manipulation.

Conclusions: These findings contribute to an understanding of the potentially deleterious psychological and behavioral effects of weight stigma while also informing future interventions to reduce weight stigma.

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Introduction

"As soon as I entered the store—when I went shopping—I immediately heard snickers… I just was appalled and, and hurt!"

– *Tyra Banks*

"Even though in my head I know… I'm not really 400 pounds, my heart is saying, 'you're not worthy.'"

– *Dr. Oz*

In 2005, former supermodel and talk show host Tyra Banks attempted to experience a day in the life of an individual with obesity by wearing a fat suit prosthesis. Then, in 2014, Dr. Oz replicated this social experiment to better understand his patients with obesity. Although Dr. Oz and Tyra Banks both have slim figures, their sentiments anecdotally suggest that artificially assuming a larger body size made them feel personally victimized for their apparent weight. Moreover, Banks and Oz did not refer simply to the pain individuals feel as targets of weight-based stigma, defined as bias or discrimination aimed at individuals perceived to be overweight (1). Instead, they described their own *personal* distress, experiencing the consequences of weight stigma firsthand. Moreover, they each reported consequently feeling accepting of overweight individuals (2,3). We wondered whether these anecdotal observations would withstand empirical scrutiny. Could simply wearing a fat suit elicit the same psychological, behavioral, and physiological responses to weight stigma observed in empirical studies? Could it also serve as a weight stigma reduction intervention?

These questions are important because even the most rigorous studies investigating weight stigma have been quasi-experimental (4). In other words, weight is never randomly assigned in weight stigma studies, limiting causal conclusions. As a result, research to date cannot firmly establish that weight status *per se* causes the negative consequences associated with weight stigma. This is particularly important given that weight, more so than other stigmatized social

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domains, is potentially changeable. Furthermore, if wearing a fat suit might help to reduce weight stigma, then testing it as an intervention is a priority. In this study, therefore, we manipulated the experience of obesity using a fat suit prosthesis.

A recent surge in research on weight-based stigma has revealed adverse psychological, behavioral, and physiological consequences for targets (5-7). Psychologically, self-reported experiences with weight-based stigmatization have been related to increased vulnerability to depression and depressive symptomatology, even after controlling for age, gender, body mass index (BMI), and age of obesity onset (8). Research has also found that individuals with overweight and obesity report lower self-esteem (9) and higher anxiety, hostility, and depression (10) than individuals with normal weight.

Weight-based stigmatization also has implications for health behaviors. In laboratory experiments, researchers have found that weight stigma and weight-based social identity threat can cause increases in calorie consumption (11,12). Moreover, exposure to weight discrimination also has been associated with increased risk of developing obesity longitudinally, even controlling for initial BMI (13).

Physiologically, exposure to experimentally manipulated weight stigma elicits greater cortisol reactivity compared with non-stigmatizing control conditions (14), particularly among those perceiving themselves as overweight (15). Cortisol is the product of the stress-responsive hypothalamic-pituitary-adrenal axis and is important in the context of weight stigma because it is linked with negative health outcomes (16), increased eating of unhealthy foods (17), and abdominal adiposity (18). This is particularly concerning given that individuals with overweight and obesity are already vulnerable to many health disparities (19).

In this study, we hypothesized that random assignment to wearing a fat suit would elicit psychological states known to be associated with weight stigma, such as hurt feelings, anxiety, anger, depressed mood, and decreased self-esteem. We also anticipated that wearing a fat suit would induce behaviors known to be associated with experiencing weight stigma, such as increased eating of unhealthy foods. Furthermore, we hypothesized that wearing the fat suit would elicit cortisol reactivity. Additionally, both Tyra Banks and Dr. Oz felt more accepting of individuals who have obesity after wearing the fat suit (2,3), which is consistent with research suggesting that taking the perspective of a stigmatized target reduces prejudice (40). We therefore empirically tested the fat suit manipulation as a weight stigma reduction intervention, hypothesizing that individuals wearing the fat suit would report lower antifat attitudes compared with control participants. Finally, because obesity reliably elicits disgust (21), as an exploratory aim, we tested whether participants wearing the fat suit would use more hand sanitizer. We suspected this might be congruent with impression management, which individuals with overweight and obesity often engage in to minimize the stereotype of uncleanliness-associated obesity (22).

Methods

Participants

We recruited 109 participants (23.9% male) from a large, public university. Students participated in exchange for credit toward a psychology course requirement. Sample size was determined based on prior Cohen's $d = 1.02$ (12) to maintain adequate power of 0.95 to detect group differences in three eating outcomes for a two-tailed test with α at 0.02. Participant age ranged from 17 to 28 years old ($M = 19.56$, SD $= 1.67$). Participants reported their ethnicity as White (26.6%), Asian (40.4%), African American (2.8%), Latino/a (19.3%), Middle Eastern (7.3%), and Other (3.7%).

Procedure

The University of California, Los Angeles Institutional Review Board approved all procedures. This parallel design protocol is registered on clinicaltrials.gov (NCT02745405). This manuscript has been prepared according to CONSORT guidelines, where applicable (see Figure 1 for flow diagram). Before arriving, participants completed a survey that included a measure of antifat attitudes embedded among distractors. Participants then visited the laboratory individually to complete all procedures. They were instructed to refrain from eating for 1 before arriving, as eating can affect cortisol (23).

Upon arrival at the laboratory, participants were randomly assigned to the fat suit or control condition (detailed description below) according to a predetermined computer-generated simple randomization sequence. The nature of the fat suit made it impossible to blind participants and researchers to condition. To be consistent with previous intergroup research (24), we focused on same-sex interactions (i.e. the researcher and participant were always of the same sex). We avoided cross-sex interactions to mitigate concerns related to sexism, attractiveness, or romantic inclinations and to be more certain that the presence of an opposite-sex researcher during the weight-alteration did not make the manipulation more stressful. After providing informed consent, participants were told the cover story that the study was examining how the campus' physical environment is accommodating to people of different heights and weights. To bolster this cover story, participants were also informed that some conditions involved wearing stilts to alter height while some involved other physical alterations. Participant then provided a baseline salivary cortisol sample by expectorating into a 2 mL microcentrifuge tube.

Participants were then instructed to wear either the fat suit or control clothing (a long-sleeved shirt and pants identical to those on the fat suit but in the participant's own size; see Figure 2). Therefore, the only difference in appearance between the conditions was physical size. The fat suit was light, weighing 3.3 lbs. In both conditions, participants placed the clothing over what they were wearing while standing in front of a full-length mirror. The researcher ensured that participants saw themselves in the mirror by turning them toward it while helping them fasten the clothing. Next, participants were instructed to walk to the student union to receive their next task from another researcher. Given that merely knowing one's body is visible to others can induce consequences associated with weight stigma (20), this walk served to activate the experience of weight stigma. To bolster the cover story, participants also wore a pedometer, which allegedly monitored their walking patterns. At the rendezvous point, participants were given a sealed envelope and instructed to return to the original testing room to continue the study. Participants were instructed not to open the envelope, allegedly as that would compromise the double-blind nature of the study, and none did.

Upon returning to the laboratory room, participants were given 5 min to consume chocolate candies (M&Ms), potato chips (Lays), and soda (Coca-Cola), all of which had been previously weighed.

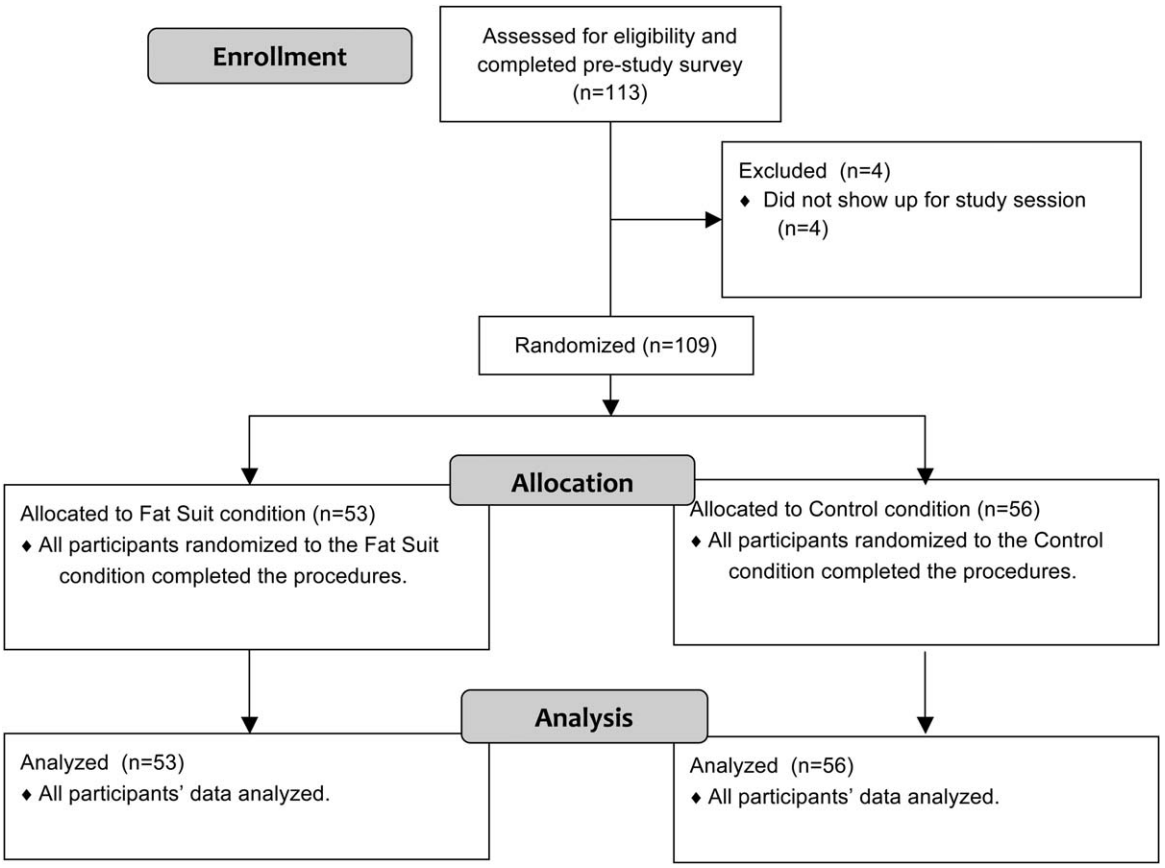

Figure 1 Study flow diagram.

To avoid floor effects, they were asked to consume some amount of the food, with the cover story that the food would return their mouths to a "physiological baseline state," ostensibly necessary for saliva sampling. Participants were also offered hand sanitizer in the event that they wanted to clean their hands. In actuality, we used the sanitizer as a possible indicator of an attempt to counteract uncleanliness stereotype associated with obesity (22). After 5 min, the researcher removed the food and sanitizer and weighed what remained in another room, leaving the participant to finish the surveys. Later, the researcher returned to collect a second salivary cortisol sample. After completing the surveys, participants removed all study-related clothing and had their height and weight measured. The researcher then conducted a funneled debriefing assessing the believability of the cover story. No participants guessed the true purpose. Participants were then fully debriefed and assigned research credit. No adverse events occurred.

Psychological measures

Participants were asked to reflect specifically on their walk across campus while filling out all psychological measures, except antifat attitudes, for which they were asked to merely indicate their agreement or disagreement with the items.

Anger. Participants' anger was assessed using seven items taken from a validated short version of the Profile of Mood States (POMS) anger subscale (25). These items included angry, peeved, grouchy, annoyed, resentful, bitter, and furious ($\alpha = 0.94$). The item response scale ranged from 1 *(not at all)* to 7 *(extremely)*.

Figure 2 Research staff member wearing the fat suit and control clothing. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

Anxiety. Participants' anxiety was assessed using six items from the validated short version of the POMS anxiety subscale (25), including how tense, on edge, restless, nervous, uneasy, and anxious they felt ($\alpha = 0.94$). The item response scale ranged from 1 *(not at all)* to 7 *(extremely)*.

Depressed mood. Participants' depressed mood was assessed using eight items from the validated short version of the POMS depressed mood subscale (25), including how unhappy, sad, blue, hopeless, discouraged, miserable, helpless, and worthless they felt ($\alpha = 0.95$). The item response scale ranged from 1 *(not at all)* to 7 *(extremely)*.

Hurt feelings. Participants' hurt feelings were assessed using eight items from the Leary and Springer Hurt Feelings Scale (26), such as, "My feelings were hurt" ($\alpha = 0.93$). The item response scale ranged from 1 *(not at all)* to 7 *(extremely)*.

Self-esteem. Participants' self-esteem was assessed using three items from the self-esteem subscale from the Four Basic Needs questionnaire (27). These items included, "My self-esteem was high," "I felt liked," and "I felt good about myself" ($\alpha = 0.81$). The item response scale ranged from 1 (*not at all)* to 5 *(very much so)*.

Antifat attitudes. Antifat attitudes were measured using the dislike subscale of the Antifat Attitudes Questionnaire (28) with the three items added by Quinn and Crocker (29) to increase internal consistency. The scale consisted of ten items (e.g., "I really don't like fat people much") rated from 1 (*strongly disagree*) to 7 (*strongly agree*). Participants completed these items 48 h before their laboratory session ($\alpha = 0.94$) and directly after the manipulation ($\alpha = 0.92$).

Physiological measures

Cortisol. Cortisol output was measured using saliva samples collected via passive drool at baseline and after the eating and drinking tasks. Saliva samples were frozen at −20°C and sent for duplicate batch assay to the Technical University of Dresden, Germany, for analysis using a chemiluminescence immunoassay. The interassay variability was 4%. The intra-assay variability ranged from 0 to 12%. As is standard with salivary cortisol, the distribution was skewed (time 1 skewness = 5.20 and time 2 skewness = 3.09) and corrected via natural log transformation (23). All analyses were performed on log-transformed values.

Behavioral measures

Consumption. A digital scale (EatSmart Precision Pro, Wyckoff, NJ) was used to measure the weight in grams of the potato chips, chocolate candies, soda, and hand sanitizer before and after the study. Quantity consumed or used was computed as the difference between these two values. The potato chips and chocolate candies variables were skewed (skewness = 2.79 and 3.64, respectively) and kurtotic (kurtosis = 8.41 and 18.55, respectively), and were therefore corrected via natural log transformation. Soda consumption did not violate normality. Therefore this variable was analyzed without any transformation.

TABLE 1 Baseline demographic and relevant characteristics by condition

Measure	Condition: Mean (standard deviation) or *n* (%)		
	Fat suit (*n* = 53)	Control (*n* = 56)	*P*[a]
Age	19.26 (1.15)	19.84 (2.02)	0.072
Gender			
Male	17 (32.10%)	9 (16.10%)	0.050[b]
Female	36 (67.90%)	47 (83.90%)	
Ethnicity			
White	18 (34.00%)	11 (19.60%)	0.288
Asian	19 (35.80%)	25 (44.60%)	
African American	1 (1.90%)	2 (3.60%)	
Latino/a	12 (22.60%)	9 (16.10%)	
Middle Eastern	2 (3.80%)	6 (10.70%)	
Other	1 (1.90%)	3 (5.40%)	
BMI	22.03 (2.52)	21.73 (2.88)	0.562
Pretest antifat attitudes	2.28 (1.14)	2.20 (1.10)	0.701

[a]Based on independent samples *t*-test or χ^2 test of independence.
[b]Because this *P* value is not less than 0.05, we did not conduct any analyses by gender.

Anthropometric measures

BMI. Trained research staff measured body weight in pounds using a platform-based bioelectric impedance monitor (Tanita SC-331S, Arlington Heights, IL). They measured the height of participants without shoes using a wall-mounted stadiometer. BMI ranged from 15.89 to 28.13 ($M = 21.88$, SD = 2.70), where 10.1% were underweight, 74.3% were normal weight, and 15.6% were overweight. No participant's BMI was in the obese range.

Manipulation check

Rejection. We used participants' feelings of rejection as a manipulation check for the experience of weight stigma, anticipating that those in the fat suit condition would report higher feelings of rejection. Participants responded to three items from the belonging subscale taken from the Four Basic Needs questionnaire (27). These items included: "I felt rejected," "I felt disconnected," "I felt like an outsider" ($\alpha = 0.85$). The item response scale ranged from 1 (*not at all)* to 5 (*very much so*).

Results

Data were collected between March and December of 2014. The two groups were not different at baseline (Table 1). Table 2 displays descriptive statistics and tests of group differences on outcomes.

Manipulation check

Consistent with predictions, participants reported significantly greater feelings of rejection than control participants. Given that

TABLE 2 Mean psychological, physiological, and behavioral outcomes for fat suit/control conditions

Measure	Condition: Fat suit ($n = 53$)	Condition: Control ($n = 56$)	*df*	*t* or *F*	*P*	*d* or η_p^2	95% CI
Manipulation check							
Rejection	3.02 (0.93)	2.37 (1.15)	107	$t = 3.23$	0.002**	$d = 0.62$	0.25 to 1.05
Psychological							
Anger	1.57 (0.85)	1.26 (0.48)	107	$t = 2.38$	0.019*	$d = 0.45$	0.05 to 0.57
Anxiety	3.00 (0.94)	2.34 (1.11)	107	$t = 3.38$	0.001***	$d = 0.64$	0.28 to 1.06
Depressed mood	1.76 (0.91)	1.42 (0.68)	107	$t = 2.21$	0.029*	$d = 0.42$	0.03 to 0.64
Hurt feelings	3.16 (1.50)	2.30 (1.18)	107	$t = 3.30$	0.001***	$d = 0.64$	0.34 to 1.36
Self-esteem	2.03 (0.82)	2.32 (0.94)	107	$t = -1.75$	0.083	$d = 0.33$	−0.63 to 0.04
Antifat attitudes	2.49 (1.19)	2.17 (1.05)	106	$F = 1.52$	0.132	$\eta_p^2 = 0.02$	−0.06 to 0.61
Physiological							
Time 2 cortisol[a] (LN)	16.30 (15.57)	14.91 (11.59)	106	$F = 0.09$	0.771	$\eta_p^2 = 0.001$	2.35 to 2.67
Behavioral[b]							
Chip consumption (LN)	38.32 (50.53)	15.25 (18.28)	107	$t = 2.85$	0.005**	$d = 0.55$	0.20 to 1.12
Chocolate consumption (LN)	15.75 (19.74)	6.43 (6.82)	107	$t = 3.04$	0.003**	$d = 0.58$	0.21 to 1.00
Soda consumption	138.68 (89.94)	106.86 (70.46)	107	$t = 2.06$	0.042*	$d = 0.40$	1.23 to 62.41
Hand sanitizer	0.58 (0.60)	0.54 (0.57)	107	$t = 0.44$	0.662	$d = 0.07$	−0.17 to 0.27

Numbers in parentheses are standard deviations (SD). LN indicates the variable underwent a natural log transformation, and test statistics reflect analyses of log-transformed values.
[a]Cortisol mean values are in nmol/L. Analyses control for pre-manipulation values.
[b]Behavioral outcome mean values are in grams.
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

participants in both conditions wore identical clothing, we concluded that these feelings of rejection could be attributed to experiencing weight stigma during the manipulation.

Affect

Independent samples *t*-tests were used to compare mean values between the fat suit condition and the control condition for psychological and behavioral outcomes. After walking across campus, participants in the fat suit reported significantly greater feelings of anger, anxiety, greater depressed mood, and hurt feelings than control participants, and marginally lower self-esteem than control participants.

Consumption

Independent samples *t*-tests revealed participants wearing the fat suit consumed significantly more grams of potato chips, chocolate candies, and soda than control participants. However, there was no difference between conditions in grams of hand sanitizer used.

Antifat attitudes

Paired samples *t*-tests revealed no significant change in antifat attitudes from pretest to postmanipulation among either fat suit participants ($M_1 = 2.28$, $SD_1 = 1.14$, $M_2 = 2.49$, $SD_2 = 1.19$, $t_{(52)} = 1.48$, $P = 0.148$, 95% CI [−0.08 to 0.51], Cohen's $d = 0.18$) or the control participants ($M_1 = 2.20$, $SD_1 = 1.10$, $M_2 = 2.17$, $SD_2 = 1.05$, $t_{(55)} = -0.24$, $P = 0.810$, 95% CI [−0.27 to 0.21], Cohen's $d = 0.03$). A one-way ANCOVA of postmanipulation antifat attitudes in the fat suit versus control condition controlling for pretest values revealed no effect of condition (see Table 2).

Cortisol

A one-way ANCOVA of natural log-transformed postmanipulation salivary cortisol values in the fat suit condition ($M = 2.53$, $SD = 0.68$) versus the control condition ($M = 2.45$, $SD = 0.70$) controlling for baseline salivary cortisol (fat suit $M = 2.42$, $SD = 0.64$; control $M = 2.49$, $SD = 0.73$) revealed no significant effect of condition on cortisol.

Discussion

In a novel paradigm, we randomly assigned participants to undergo a weight-altering manipulation and found evidence suggesting that some consequences associated with weight-related stigma can be experienced by nonobese individuals through artificial weight manipulation. Participants reported *personal* feelings of anger, anxiety, sadness, hurt feelings, and rejection while wearing the fat suit. Participants who wore the fat suit also consumed more unhealthy food and soda relative to control participants, who wore the same clothing without the fat suit. The mean difference in total consumption between the groups was 191 kcal, which is meaningful given that adults are recommended to consume 2,000 kcal daily. Overall, these results dovetail with prior research suggesting that weight stigma may elicit coping through increased caloric intake (30). Our affective results are also consistent with evidence that weight stigma directly affects emotional well-being (11). We note that our sample was on average normal weight, and BMI did not moderate the relationship between the weight-altering manipulation and any outcome (all $P > 0.100$). This suggests that wearing the fat suit carried

negative consequences for all individuals, irrespective of body weight. That is, similar to the opening sentiments of Tyra Banks and Dr. Oz, both of whom are thin, these findings support our contention that a nonobese individual can potentially experience the same consequences associated with weight stigma that people with overweight or obesity would just by "walking a mile in their shoes." Although this may limit the generalizability of our findings to individuals with overweight and obesity, they nonetheless further reveal just how pervasive weight stigma may be.

"Walking a mile in their shoes," however, appeared to have no effect on antifat attitudes, which did not change from pretest to postmanipulation among fat suit participants. Even more surprising is that the pattern of means between groups is the opposite of what we expected, where the fat suit participants reported marginally *higher* antifat attitudes than the control participants. These results, though, are consistent with research that shows similar levels of antifat bias among both individuals with normal weight and individuals who have obesity (28), but underscore the difficulty of designing interventions to combat antifat attitudes (31). We also found no significant difference between groups in hand sanitizer usage, which we used to probe participants' desire to counteract the "disgust" stereotype associated with obesity (22). Social norms of cleanliness, in this case, may have created a ceiling effect, overpowering any effect of internalized disgust. Future research should explore other indicators of internalized disgust, such as desire to wear clean clothing (22). Additionally, although previous research has shown that weight stigma triggers release of the stress hormone cortisol (14,15), we found no evidence of increased cortisol reactivity among fat suit versus control participants. This points to a potential boundary condition of the effects of social-evaluative threat (32) on cortisol reactivity. Alternatively, the two groups may have shown differential cortisol *recovery* as opposed to reactivity—an idea our design could not test. Importantly, the average time interval between the baseline and second cortisol sample was only 36 min. Because cortisol changes can take 30 min to register in saliva (23), it is possible that the second sample reflected cortisol levels before participants even put on the fat suit rather than during the stigmatizing walk across campus. Given this, future research should collect multiple saliva samples, including baseline, poststress, and recovery, to better estimate the peak of cortisol reactivity and recovery. More generally, these null findings may have arisen from insufficient dosage—participants may not have been in the fat suit long enough to affect these outcomes.

We also did not assess definitively whether or not participants were experiencing weight stigma as a function of wearing the fat suit. Given that individuals in both the fat suit and control condition were equal in appearance (i.e., wore clothing of the same color, shape, material etc.) with the exception of the fat suit, we inferred that feeling rejected was likely an accurate proxy for the experience of weight stigma. However, an alternative explanation is that we observed a priming effect. Activating overweight stereotypes has been shown to lead to stereotype-conducive behaviors such as eating unhealthy foods (33), with this effect emerging even when simply viewing images of overweight individuals in real-world settings (34). This interpretation is also consistent with an embodiment framework, which assumes that feelings, thoughts, and behaviors are grounded in sensory experiences and bodily states (35). This implies that changing individuals' basic physical experience via size alteration may in turn affect cognitions, emotions, and behaviors associated with being overweight. Thus, having individuals embody "fatness" may have activated the negative emotions and behaviors we observed. We also acknowledge the possibility that changing one's physical appearance in any fashion (not specifically via a fat suit) may be enough to elicit similar psychological and behavioral reactions. However, the participants in the control group also altered their physical appearance—in particular, by wearing a conspicuous, bright yellow shirt and sweatpants—yet they did not exhibit the same affect or eating behavior. This bolsters our confidence that it was the size manipulation and resulting experience of weight stigma specifically that produced our results.

In sum, these findings contribute new and intriguing information to our understanding of the implications of stigma. We used a novel weight-alteration paradigm to directly expose participants to an experience they may interpret as stigmatizing, expanding upon prior work using videos or vignettes (11,14). In doing so, we were able to show that manipulating weight may have a detrimental impact on eating and psychological well-being, responses akin to the experience of weight stigma, without reducing antifat attitudes. These findings likely have particularly important implications for stigma reduction interventions. Research has shown that perspective taking can lead to social bonding by decreasing prejudice and stereotypes of others (36,37) and enhancing attitudes toward socially stigmatized groups (e.g., ethnic minorities (36), people with AIDS (38), and the elderly (37)). Overweight individuals, however, may be part of a socially stigmatized group representing a boundary condition in which perspective taking may be unsuccessful. This further highlights the pervasiveness and deep-rooted nature of weight stigma (4), making it particularly resistant to intervention. We suggest that future research continue pursuing antifat attitude reduction, perhaps by extending methods used in intergroup contact theory (39) to the realm of weight stigma, to help address an urgent need for the development of interventions to reduce the prevalence and consequences of weight stigma. O

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