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Experiences of Weight Stigma in Everyday Life: Implications for Health Motivation

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Weight stigma is a pervasive social problem that can negatively impact the health and well-being of stigmatized individuals. The present study used ecological momentary assessment (EMA) to assess the motivational consequences of weight stigma in people's everyday lives. Forty-six community adults (22 men, 24 women) completed baseline measures of prior stigma experiences and internalized weight bias before taking part in the EMA component of the study. Over a 2-week period, participants recorded their experiences with weight stigma immediately after they occurred, and also reported their current mood and motivation to diet, exercise, and lose weight. At the end of each day, participants again reported their mood and motivation to diet, exercise, and lose weight. Participants experienced weight stigma almost once per day, on average, indicating that stigma experiences are common in people's everyday lives. At the episode level, lower positive affect (PA) following a stigma experience was associated with lower motivation to diet, exercise, and lose weight, but only for women, individuals high in prior experiences with stigma, and individuals high in internalized weight bias. We also found that the more frequently people experienced stigma on a given day, the less motivated they were to diet, exercise, and lose weight at the end of the day. Furthermore, these associations were mediated by low PA. These findings highlight the deleterious nature of stigma experiences, and can also inform public health and intervention efforts to reduce the negative impact of stigma and improve the well-being of affected individuals.

Keywords: weight stigma, health motivation, positive affect, negative affect, ecological momentary assessment

Weight stigma is a widespread social problem, and there is evidence that the prevalence of weight stigma is increasing. For example, attitudes toward people who are obese appear to be worsening (e.g., Latner & Stunkard, 2003), and people who are obese are now evaluated more negatively than are a range of other marginalized groups (e.g., homosexuals; Vartanian, 2010). Furthermore, experiences with weight stigma now appear to be as common as experiences with stigma based on race (Andreyeva, Puhl, & Brownell, 2008). Importantly, experiences with weight stigma have been associated with a range of negative consequences for the stigmatized individuals, including psychological outcomes such as negative body image, depression, and low self-esteem (Friedman et al., 2005; Vartanian & Novak, 2011; Vartanian & Shaprow, 2008), as well as negative motivational and behavioral consequences such as binge eating (Ashmore, Friedman, Reichmann, & Musante, 2008; Myers & Rosen, 1999; Vartanian, 2015; Vartanian & Porter, 2016), decreased motivation to diet (Puhl & Brownell, 2006), and decreased motivation to exercise (Vartanian & Novak, 2011; Vartanian & Shaprow, 2008). These motivational and behavioral consequences are particularly important because they suggest that weight stigma can interfere with people's ability to lead a healthy lifestyle and manage their weight, which could have negative consequences for long-term health and well-being.

Although past research suggests that stigma experiences are associated with decreased motivation to engage in health behaviors, the majority of these studies are limited by their reliance on cross-sectional designs involving retrospective self-reports of stigma experiences and of health behaviors (e.g., Vartanian & Novak, 2011). Such retrospective approaches require individuals to recall events that happened at some point in the past and to estimate what would be an average or typical response for them to such circumstances. Consider, for example, that the Stigmatizing Situations Inventory (SSI; Myers & Rosen, 1999) asks respondents about their stigma experiences throughout the course of their entire lives. One of the primary limitations of traditional cross-sectional designs is that retrospective recall of experiences is fallible and potentially biased.

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Moving beyond self-report, there have been some recent attempts to examine the impact of weight stigma on health behaviors in an experimental context, but experimental studies conducted in the laboratory often lack ecological validity and are often of limited duration (minutes to hours). Furthermore, experimental studies of weight stigma rarely truly induce a personal feeling of being stigmatized. For example, Schvey, Puhl, and Brownell (2011) had women who were overweight watch a video showing stereotypical depictions of individuals with obesity or a neutral control video, after which they were provided with some snacks. Women who watched the stigmatizing video ate more than did women who watched the control video. However, watching a video of other people being stigmatized does not necessarily parallel the experience of being stigmatized oneself. Thus, although previous studies point to the possibility that weight stigma negatively impacts health motivation and behaviors, these studies are limited in their capacity to elucidate the complex and dynamic nature of how personal stigma experiences impact individuals in their everyday lives.

Ecological momentary assessment (EMA) overcomes some of the limitations of past research by allowing researchers to observe dynamic processes as they unfold in people's everyday lives. EMA involves having participants complete brief questionnaires multiple times per day over a period of days or weeks. This approach provides an assessment of individuals' ongoing experiences as they occur in their natural environment, and provides a number of benefits for examining people's responses to stigma experiences. First, this approach largely eliminates recall biases because participants are reporting on their response to a stigma experience soon after the experience occurs. Second, this approach also allows for an examination of the association between stigma experiences and motivation in an ecologically valid context (Smyth & Heron, 2012). Thus, EMA is an alternative method that can provide a richer picture of the association between personal stigma experiences and health motivation in natural settings than is readily possible with other approaches.

Another benefit of using an EMA approach to examining people's reactions to weight stigma experiences is that, by providing multiple data points in real time, EMA allows for a detailed examination of possible underlying mechanisms. Positive affect (PA) and negative affect (NA) may be particularly relevant in the context of weight stigma. First, negative emotions are related to weight stigma experiences, and play a central role in Tomiyama's (2014) cyclical model of obesity/weight stigma. Second, positive and negative emotions are known to impact motivation and a range of health-related behaviors. For example, PA is associated with engagement in health-promoting behaviors, such as exercise (Watson, 1988), and NA is associated with engagement in health-compromising behaviors, such as smoking (Brandon, 1994) and alcohol consumption (Cooper, Frone, Russell, & Mudar, 1995). There is also some evidence from correlational studies that the association between stigma experiences and unhealthy eating behavior (binge eating) is mediated by NA (Suisman, Slane, Burt, & Klump, 2008). In this study, we used an EMA design to examine the association between PA/NA and health motivation in order to provide further insights into the potential negative impact of weight stigma experiences. Furthermore, because weight stigma is often construed as contributing to stress (e.g., Tomiyama, 2014), we also examined the association between previous stigma experiences and resting physiological arousal (as indexed by resting heart rate).

Although there is growing evidence of the negative impact of weight stigma experiences, there is also some evidence that not everyone responds to stigma experiences in the same way. For example, Latner, Wilson, Jackson, and Stunkard (2009) found that, among women in a weight-loss treatment program, those who reported more frequent past experiences with weight stigma lost more weight over the course of the treatment program. In contrast, Wott and Carels (2010) found that individuals with a greater reported history of experiencing weight stigma had less success in a weight-loss treatment program. In another study, Vartanian and Novak (2011) found that reported frequency of past stigma experiences was associated with lower motivation to exercise only among individuals who had internalized societal beliefs about obesity. With respect to demographic characteristics, research indicates that heavier individuals and women report more frequent weight-based stigmatization (e.g., Puhl, Andreyeva, & Brownell, 2008), but little is known about how these characteristics are related to people's reactions to weight stigma experiences.

The Present Study

The aim of the present study was to develop a more refined understanding of the affective and motivational correlates of weight stigma experiences. Each time participants experienced an episode of weight stigma over the course of two weeks, they reported their PA, NA, and motivation to diet, exercise, and lose weight. We predicted that negative affective reactions to weight stigma would be associated with lower motivation to diet, exercise, and lose weight, and that positive affective reactions would be associated with higher motivation to diet, exercise, and lose weight. Participants also completed a survey at the end of the day in which they responded to the same affect and motivation measures as in the episodic (event-contingent) component. We predicted that more frequent experiences with weight stigma on a given day would be associated with more end-of-day NA, less end-of-day PA, and less end-of-day motivation to diet, exercise, and lose weight. We also predicted that affective states would mediate the link between frequency of stigma experiences and motivation to diet, exercise, and lose weight. Finally, we explored whether past experiences with weight stigma, internalized weight bias, sex, and body mass index (BMI) moderated any of these associations. Specifically, we predicted that stigma experiences might have more negative impacts among individuals with a greater history of past stigma experiences, individuals with a greater degree of weight bias internalization, women, and individuals with a higher BMI.

Method

Participants

Participants were 46 adult community members (22 men, 24 women) who were recruited for a study on "the life experiences of overweight and obese individuals." Participants were recruited through newspaper advertisements and from online classified advertisements in a large metropolitan center in Australia. Their mean age was 28.39 years (range = 19–70), and their mean BMI

(kg/m^2) was 30.52 (range = 22.25–42.62). We included all participants, regardless of whether or not their BMI qualified as overweight/obese because even individuals who are not overweight according to BMI cutoffs can experience the negative consequences associated with weight stigma (e.g., O'Brien et al., 2016; Vartanian & Shaprow, 2008). Recent work has also demonstrated that perceived overweight is more relevant than actual BMI to the effects of exposure to weight stigma (Major, Hunger, Bunyan, & Miller, 2014) and weight stigma is associated with various health outcomes above and beyond actual BMI (Potter et al., 2015). The majority of participants were single (n = 29), earned less than AUD$20,000 per year ($n$ = 24), and were either White (n = 21) or Asian (n = 22). Participants were paid AUD$110 for their participation. This study was approved by the university's ethics committee.

Materials

Baseline measures. At an initial session, participants completed the following measures:

Prior experiences with weight stigma. The SSI (Myers & Rosen, 1999) was used to assess lifetime experiences with weight stigma. This measure contains 50 items that cover a broad range of domains of weight stigma (e.g., negative comments from family members or strangers, job discrimination, inappropriate comments by doctors). The frequency of each experience is rated on a 10-point scale ranging from 0 (*never*) to 9 (*daily*). Scores on each item were averaged, and higher scores indicated more frequent reported experiences with weight stigma. Cronbach's alpha in this study was .94.

Internalized beliefs. Participants completed a modified version of the Weight Bias Internalization Scale (Durso & Latner, 2008) to assess the extent to which they had internalized negative weight-related attitudes. Pearl and Puhl (2014) modified the original scale to make it more accessible to individuals from different weight categories by replacing the word "overweight" with "my weight." The scale consists of 11 items (e.g., "I am less attractive than most other people because of my weight") rated on a 7-point scale (1 = *Strongly agree*, 7 = *Strongly disagree*). After reverse-coding relevant items, mean scores were computed with higher values indicating greater weight bias internalization. Cronbach's alpha was .86.

Resting heart rate and BMI. Heart rate was measured at the beginning of the session after a 5-min rest period. This measure was included because weight stigma can be considered a stressful experience (Tomiyama, 2014), and stress has implications for health behavior, health, and well-being. Elevated resting heart rate is also a risk factor for cardiovascular disease (Fox et al., 2007). Thus, we measured resting heart rate as a proxy for stress to provide further evidence for the stressful effects of weight stigma. Height and weight were measured at the end of the session and were used to calculate participants' BMI.

EMA measures. The EMA surveys were designed using Satellite Forms (Version 8.0). For each of the measures described below, participants were asked to "Please rate how you feel RIGHT NOW" with ratings made on a 5-point scale (0 = *Not at all*, 4 = *Extremely*).[1]

Affect. Participants indicated the extent to which they felt four positive emotions (happy, strong, proud, confident) and four negative emotions (angry, discouraged, embarrassed, ashamed). Items were averaged to form a composite index of PA (α = .90) and NA (α = .87). Note that the pattern of results for NA was virtually identical when we separated anger from the three other negative emotions (which are all shame-related emotions). Only the composite index of NA is reported in the analyses below.

Motivation. Three items assessed the extent to which participants were motivated to diet or eat healthy, exercise or be physically active, and try to lose weight.

End-of-day survey. Just before going to bed each night, participants completed the same measures of affect and motivation that they had completed in response to the daily stigma episodes.

Procedure

Participants came to the research laboratory to complete the baseline questionnaires. Following a 5-min rest period, participants had their heart rate recorded and then completed the questionnaire packet. Next, participants were given a personal digital assistant (PDA) device (Hewlett Packard iPAQ212) to record their stigma experiences, and were given a tutorial on how to use the PDA to record their experiences with stigma. First, participants were given an operational definition of weight stigma ("weight-based stigma or discrimination is any instance where you feel you are being treated differently because of your weight") and they were then provided with several specific examples of stigma drawn from the SSI. Furthermore, in order to minimize any potential expectancy effects or reactivity, participants were told the following:

> Not much research has been done in the area of weight stigma and therefore we don't have expectations as to how many episodes or what type of episodes you should report on. Rather, we are interested in the episodes of weight stigma that naturally occur in your everyday life. In this way you can act as "participant investigators" and help us find out more about the phenomenon of weight stigma. We also understand that situations may be ambiguous and events may or may not be interpreted as weight stigma depending on the person involved or the context of the event. We ask that you complete a survey any time *you* interpret the situation as being stigmatizing.

Participants were asked to complete a survey each time they experienced an episode of weight stigma over the subsequent 2-week period (i.e., event-contingent reporting) and also to complete the end-of-day survey prior to going to bed each night. Finally, participants' height and weight were measured at the end of the initial session.

Analytic Strategy

First, we examined the associations among participants' baseline characteristics. Specifically, we examined the bivariate correlation between frequency of previous stigma experiences (i.e., SSI scores) and weight bias internalization, age, BMI, and resting heart rate. We used multilevel modeling to analyze the EMA data because these data were nested in structure (i.e., multiple stigma episodes nested within individuals and multiple end-of-day reports

[1] Participants also reported on a range of contextual factors associated with the stigma experience, such as who the perpetrator was and how many bystanders were present. Details of those contextual factors have been reported elsewhere (Vartanian, Pinkus, & Smyth, 2014), and were unrelated to the research questions addressed in this paper.

nested within individuals). The data were analyzed with full maximum likelihood estimation using HLM 6.06 software (Raudenbush, Bryk, & Congdon, 2008). For the stigma episode measures, we first examined whether baseline characteristics (BMI, sex, prior stigma experiences, and internalized weight bias) predicted affective and motivational outcomes. For the motivational measures, we further tested whether affect predicted motivation, and whether the association between affect and motivation was moderated by any of the baseline characteristics. Finally, for the end-of-day reports, we examined whether (a) frequency of stigma experiences on a given day were associated with affect and motivation at the end of that day, (b) these associations were moderated by baseline characteristics, and (c) affect mediated the link between frequency of stigma experiences and motivation. For each model, all continuous predictor variables were centered, and gender was dummy-coded (0 = female, 1 = male). Any significant moderation effects were probed using the methods described in Preacher, Curran, and Bauer (2006). The multilevel mediation analyses were conducted using the procedures outlined in Bauer, Preacher, and Gil (2006).

Results

Baseline Measures

The mean rating on the SSI was 2.24 (SD = 1.51) indicating that participants, on average, reported experiencing weight stigma approximately "Several times in your life." Consistent with previous research, more frequent experiences with weight stigma were positively correlated with internalized weight bias (Table 1). We also found that frequency of experiences with weight stigma was positively correlated with resting heart rate, but not with age or BMI. In addition, internalized weight bias was positively correlated with resting heart rate. No other associations were significant. Importantly, all associations held when controlling for participants' BMI.

EMA Data

Participants reported an average of 11.12 (SD = 10.89) episodes of weight stigma over the 14-day study period (0.79 episodes per day). Furthermore, the overall frequency of stigma experiences during the EMA portion of the study was positively correlated with scores on the SSI, r = .45, p = .002.

Responses to stigma episodes. See Table 2 for means (intercepts) and standard errors for each of the variables.

Table 1
Correlations Between Baseline Characteristics and Frequency of Stigma Experiences

Variable	SSI	WBIS	Age	BMI
WBIS	.50***			
Age	.07	−.14		
BMI	.23	.14	.15	
Heart rate	.33*	.31*	−.18	.06

Note. SSI = Stigmatizing Situations Inventory; WBIS = Weight Bias Internalization Scale; BMI = body mass index.
* $p < .05$. *** $p < .001$.

Table 2
Descriptive Statistics for EMA Variables

Variable	M	SE
Episodic variables		
Positive affect	.99	.11
Negative affect	1.87	.13
Motivation to diet	2.29	.15
Motivation to exercise	2.25	.16
Motivation to lose weight	2.43	.13
End-of-day variables		
Positive affect	1.43	.11
Negative affect	.79	.09
Motivation to diet	2.13	.13
Motivation to exercise	1.99	.13
Motivation to lose weight	2.21	.12

Note. EMA = ecological momentary assessment. All values were estimated using multilevel modeling. The values represent mean ratings on scales ranging from 0 (*Not at all*) to 4 (*Extremely*).

PA. Higher internalized weight bias was associated with less PA following a stigma experience (b = −0.33, SE = 0.06, $t(40)$ = −5.51, $p < .001$), and women also reported less PA than did men following a weight stigma episode (b = 0.56, SE = 0.21, $t(40)$ = 2.65, p = .01). Although internalized weight bias remained a significant predictor of PA in the overall model that included sex, BMI, and prior stigma experience, sex was no longer a significant predictor. No other effects were significant.

NA. More frequent prior stigma experiences were associated with more NA following a stigma experience (b = 0.15, SE = 0.06, $t(40)$ = 2.46, p = .02), but that association became nonsignificant in the model that included sex, BMI, and internalized weight bias. No other effects were significant.

Motivation to diet. Following an experience with weight stigma, women reported less motivation to diet than did men (b = 0.56, SE = 0.28, $t(40)$ = 1.99, p = .05), and higher internalized weight bias was associated with lower motivation to diet (b = −0.23, SE = 0.10, $t(40)$ = −2.29, p = .03). NA following a stigma episode was not associated with motivation to diet (p = .61), nor were there any interactions between NA and the baseline characteristics in predicting motivation to diet. There was a positive association between PA and motivation to diet (b = 0.26, SE = 0.13, $t(41)$ = 1.98, p = .05), as well as significant interactions between PA and gender (b = −0.59, SE = 0.24, $t(458)$ = −2.47, p = .01), between PA and prior stigma experiences (b = 0.21, SE = 0.07, $t(40)$ = 3.25, p = .003), and between PA and internalized weight bias (b = 0.36, SE = 0.11, $t(40)$ = 3.23, p = .003). Simple slopes analyses indicated that, for women, for those with more frequent prior stigma experiences, and for those with higher internalized weight bias, less PA was associated with less motivation to diet (gender: b = 0.57, SE = 0.18, z = 3.15, p = .002; prior stigma experiences: b = 0.50, SE = 0.12, z = 4.25, $p < .001$; internalized weight bias: b = 0.62, SE = 0.15, z = 4.17, $p < .001$). In contrast, for men, for those with less frequent prior stigma experiences, and for those with lower internalized weight bias, there was no association between PA and motivation to diet (gender: b = −0.02, SE = 0.16, z = −0.14, p = .89; prior stigma experiences: b = −0.15, SE = 0.15, z = −0.99, p = .32; internalized weight bias: b = −0.22, SE = 0.17, z = −1.25, p = .21). There was no interaction involving BMI.

Motivation to exercise. Women (vs. men) reported lower motivation to exercise following a stigma experience ($b = 0.75$, $SE = 0.29$, $t(40) = 2.63$, $p = .01$), and higher internalized weight bias was associated with less motivation to exercise following an experience of weight stigma ($b = -0.31$, $SE = 0.11$, $t(40) = -2.84$, $p = .007$). As with motivation to diet, NA was not associated with motivation to exercise following a stigma episode ($p = .48$), and there were no interactions between NA and BMI, prior stigma experiences, or internalized weight bias. There was a significant interaction between NA and gender ($b = 0.40$, $SE = 0.20$, $t(458) = 2.08$, $p = .04$), but neither of the simple slopes were significant (women: $b = -0.21$ $SE = 0.15$, $z = -1.35$, $p = .18$; men: $b = 0.20$, $SE = 0.12$, $z = 1.64$, $p = .10$). There was a positive association between PA and motivation to exercise ($b = 0.32$, $SE = 0.12$, $t(41) = 2.67$, $p = .01$), and there were also significant interactions between PA and gender ($b = -0.62$, $SE = 0.23$, $t(458) = -2.67$, $p = .01$), between PA and prior stigma experiences ($b = 0.18$, $SE = 0.08$, $t(40) = 2.27$, $p = .03$), and between PA and internalized weight bias ($b = 0.31$, $SE = 0.10$, $t(40) = 3.19$, $p = .003$). Simple slopes analyses indicated that, for women, for those with more frequent prior stigma experiences, and for those with higher internalized weight bias, less PA was associated with less motivation to exercise (gender: $b = 0.63$, $SE = 0.19$, $z = 3.40$, $p < .001$; prior stigma experiences: $b = 0.52$, $SE = 0.11$, $z = 4.62$, $p < .001$; internalized weight bias: $b = 0.62$, $SE = 0.15$, $z = 4.25$, $p < .001$). In contrast, for men, for those with less frequent prior stigma experiences, and for those with lower internalized weight bias, there was no association between PA and motivation to exercise (gender: $b = 0.01$, $SE = 0.14$, $z = 0.07$, $p = .95$; prior stigma experiences: $b = -0.03$, $SE = 0.15$, $z = -0.21$, $p = .84$; internalized weight bias: $b = -0.10$, $SE = 0.17$, $z = -0.60$, $p = .55$). There was no interaction involving BMI.

Motivation to lose weight. Higher internalized weight bias was associated with lower motivation to lose weight following a stigma experience ($b = -0.17$, $SE = 0.08$, $t(40) = -2.13$, $p = .04$). NA following a stigma episode was not directly associated with motivation to lose weight ($p = .26$), but there was an interaction between prior stigma experiences and NA ($b = -0.15$, $SE = 0.07$, $t(40) = -2.07$, $p = .045$). Simples slopes analyses indicated that NA was not associated with motivation to lose weight among those with more frequent prior stigma experiences ($b = -0.06$, $SE = 0.11$, $z = -0.52$, $p = .60$), but was positively related to motivation to lose weight among those with less frequent prior stigma experiences ($b = 0.41$, $SE = 0.14$, $z = 2.83$, $p = .005$). There was no interaction between NA and internalized weight bias. There was a marginal positive association between PA and motivation to lose weight ($b = 0.24$, $SE = 0.13$, $t(41) = 1.88$, $p = .07$), and there were significant interactions between PA and gender ($b = -0.48$, $SE = 0.24$, $t(458) = -1.99$, $p = .047$), between PA and prior stigma experiences ($b = 0.23$, $SE = 0.06$, $t(40) = 3.96$, $p < .001$), and between PA and internalized weight bias ($b = 0.30$, $SE = 0.12$, $t(40) = 2.49$, $p = .02$). Simple slopes analyses indicated that, for women, for those with more frequent prior stigma experiences, and for those with higher internalized weight bias, less PA was associated with less motivation to lose weight (gender: $b = 0.52$, $SE = 0.18$, $z = 2.81$, $p = .005$; prior stigma experiences: $b = 0.33$, $SE = 0.10$, $z = 3.32$, $p = .001$; internalized weight bias: $b = 0.56$, $SE = 0.15$, $z = 3.63$, $p < .001$). In contrast, for men, for those with less frequent prior stigma experiences, and for those with lower internalized weight bias, there was no association between PA and motivation to lose weight (gender: $b = 0.04$, $SE = 0.16$, $z = 0.22$, $p = .82$; prior stigma experiences: $b = -0.03$, $SE = 0.12$, $z = -0.21$, $p = .83$; internalized weight bias: $b = -0.14$, $SE = 0.18$, $z = -0.80$, $p = .42$). There was no interaction involving BMI.

End of day reports. More frequent daily experiences with weight stigma were associated with lower motivation to diet ($b = -0.12$, $SE = 0.04$, $t(597) = -3.31$, $p = .001$), exercise ($b = -0.11$, $SE = 0.05$, $t(597) = -2.12$, $p = .04$), and lose weight ($b = -0.13$, $SE = 0.04$, $t(597) = -3.14$, $p = .002$) at the end of the day. More daily episodes of stigma were not related to NA at the end of the day ($p = .16$), but were negatively related to PA at the end of the day ($b = -0.08$, $SE = 0.03$, $t(597) = -2.57$, $p = .01$). None of these associations were moderated by the baseline characteristics. Lower PA at the end of the day was associated with lower motivation to diet ($b = 0.48$, $SE = 0.08$, $t(45) = 6.01$, $p < .001$), exercise ($b = 0.46$, $SE = 0.08$, $t(45) = 5.46$, $p < .001$), and lose weight ($b = 0.43$, $SE = 0.08$, $t(45) = 5.40$, $p < .001$) at the end of the day. Follow-up multilevel mediation analyses showed that PA mediated the association between stigma experiences and motivation to diet (random indirect effect $= -0.06$, $SE = 0.03$, 95% CI [-0.11, -0.002]), motivation to exercise (random indirect effect $= -0.08$, $SE = 0.03$, 95% CI [-0.13, -0.02]), and motivation to lose weight (random indirect effect $= -0.06$, $SE = 0.03$, 95% CI [-0.11, -0.01]).

Discussion

This study examined reactions to weight stigma in participants' everyday lives. When using the SSI to assess lifetime stigma experiences, participants reported experiencing stigma approximately "several times in [their] life." Using the more ecologically valid EMA assessment, however, participants reported experiencing weight-based stigma almost once per day. Thus, weight stigma experiences appear to be much more common in people's everyday lives than had previously been captured by (retrospective) self-report measures. One explanation for this discrepancy may be that people forget many of the experiences they have had with stigma when asked to retrospectively recall those experiences over a long period of time—indeed, one of the advantages of EMA is that it overcomes this recall bias. A related issue may be that, when retrospectively recalling stigma experiences, people focus on major events, omitting relatively minor everyday experiences that are captured with EMA. Of course, even relatively minor everyday stigma experiences could have a significant impact on people's well-being (as indicated by the current study, and consistent with research showing that so-called "daily hassles" are associated with poorer self-reported health; DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982). Future research could continue to explore the contribution of different measures of weight stigma to health and well-being.

In addition to assessing the frequency of stigma experiences in everyday life, the present study also examined the association between stigma experiences and motivation to diet, exercise, and lose weight. Previous correlational studies reported that experiences with weight stigma are associated with decreased motivation to diet and exercise (Puhl & Brownell, 2006; Vartanian & Novak, 2011; Vartanian & Shaprow, 2008), and some recent experimental studies indicate that exposure to stigmatizing media leads to in-

creased food intake among women who are overweight (Schvey et al., 2011). Using a more ecologically valid assessment, we found that the more frequently participants experienced weight stigma on a particular day, the less motivated they were to diet, exercise, and lose weight at the end of that day. These findings are consistent with another study showing that more frequent experiences with stigma throughout the day was associated with worse self-report diet quality on that day (Seacat, Dougal, & Roy, 2016). Collectively, these findings provide compelling evidence that weight stigma has negative consequences for individuals' motivation to diet, exercise, and lose weight—that is, to engage in the very behaviors that would help them manage their weight and improve their health. We also recognize that excessive (or otherwise contraindicated) exercise, dieting, and related weight-loss behaviors can also cause harm. Exploring these issues are important next steps for future research.

Another novel contribution of the present research is that we were able to assess emotional responses as a potential mechanism for the stigma-motivation association. Not surprisingly, the overall level of PA following a stigma episode was quite low (0.99 on a scale from 0–4). At the episode level, we found that lower PA was consistently associated with lower reported motivation to diet, exercise, and lose weight. The same pattern was observed at the end of the day and, importantly, we also found that more frequent stigma experiences on a given day was associated with lower PA at the end of the day, which, in turn, was related to lower health motivation at the end of the day. These findings are consistent with other research suggesting that PA can be particularly important for mobilizing action (e.g., Lyubomirsky, King, & Diener, 2005), as well as evidence in particular that PA is related to exercise behavior (Watson, 1988). Contrary to our predictions, NA was not associated with frequency of stigma experiences or with motivation to diet, exercise, and lose weight. Although this finding is consistent with Watson's (1988) finding that PA but not NA was associated with exercise, other research has shown that NA is indeed associated with health behaviors such as alcohol use (Cooper et al., 1995) and with smoking (Brandon, 1994), and Smyth et al. (2007) found that both PA and NA predicted binge eating and purging behavior among individuals with bulimia nervosa.

The present study also examined potential moderators of responses to stigma experiences. BMI did not moderate any of the associations in this study, a finding that is consistent with other research showing that the association between stigma experiences and psychological/behavioral outcomes does not vary by BMI (e.g., O'Brien et al., 2016). At the episode level, we found that gender, prior experiences with weight stigma, and internalized weight bias all consistently moderated responses to weight stigma. Specifically, individuals who had experienced more stigma in the past evidenced higher levels of NA following a stigma episode, and women and individuals who had internalized weight bias to a greater extent evidenced lower levels of PA following a stigma episode. Furthermore, for women, individuals high in prior experiences with stigma, and individuals high in internalized weight bias, lower PA following a stigma episode was associated with less motivation to diet, exercise, and lose weight; for men, individuals low in prior stigma experiences, and individuals low in internalized weight bias, there was no association between PA and motivation. For individuals low in prior stigma experiences, NA following a stigma episode was actually positively associated with motivation to lose weight, but this finding did not replicate across the other motivation indices (i.e., diet and exercise). Interestingly, none of these variables moderated the association between frequency of stigma experiences during the day and affect ratings or motivation at the end of the day.

The findings of the present study, along with a growing body of correlational and experimental research, indicate that weight stigma experiences can have negative consequences for the stigmatized individuals. The consequences for motivation to engage in weight-control behaviors, and for actual dieting and exercise behaviors, can negatively impact the health and well-being of individuals across the weight spectrum. Such processes may be particularly problematic for individuals with obesity because they can exacerbate the already increased morbidity observed among those individuals. Furthermore, previous research in the domain of race discrimination has showed that stigma experiences are associated with elevated blood pressure and poorer self-reported global health (Williams, Neighbors, & Jackson, 2003). Our own results showed that more frequent lifetime experiences with weight stigma (and stronger internalization of negative attitudes and beliefs about overweight) were associated with higher resting heart rate (even when controlling for BMI); higher resting heart rate has been associated with increased risk of cardiovascular disease (e.g., Fox et al., 2007). Given the increased morbidity associated with obesity, it is worth asking, to what extent do stigma experiences contribute to ill health among individuals with obesity? A recent study by Hunger and Major (2015), for example, showed that weight stigma accounted for the association between BMI and self-reported health.

Our findings also start to shed light on mechanisms and processes that may be useful in helping individuals who experience weight stigma cope with their stigma experiences more adaptively. For example, given our findings that lower PA appears to be most predictive of impaired motivation following weight stigma, interventions aimed at boosting PA (or at least buffering against a drop in PA) in response to stigma experiences could help people maintain their motivation to engage in healthy behaviors. Such interventions might be developed and implemented at the person level, but also could form the basis of "just-in-time" intervention elements that target specific moments (e.g., following the experience of weight stigma) to deliver intervention components in real time (see Heron & Smyth, 2010).

The present study used an ecologically valid approach to assessing the daily experience of weight stigma, and thus provides novel insights into the associations among weight stigma, affect, and health motivation. There are, however, some limitations that are worth noting. First, our sample was relatively small, thus limiting the generalizability of our findings to the entire population of people who are overweight or obese. We employed analyses that often require dense data and/or large sample sizes to avoid unbiased estimates; as such, our results (particularly those with multiple factors; e.g., interaction terms) should be replicated in larger samples. Second, because we did not want to overburden our participants, we did not include assessments of motivation or affect outside of their weight-stigma experiences (e.g., during random signals). Thus, it remains possible that participants had more NA, less PA, or were less motivated in daily life, independent of their stigma experiences; future EMA studies could include assessments of nonstigma comparative moments to continue to

explore this issue. Third, the focus of this research was on health motivation, and we therefore did not obtain any objective assessment of physical activity or eating behavior throughout the day or in response to stigma. Future research could include such assessments to determine whether stigma experiences also impact actual health behaviors.

In conclusion, the present study indicates that weight stigma is a common experience in the everyday lives of individuals who are overweight and obese, and that stigma experiences are associated with lower motivation to engage in health-related behaviors. Furthermore, the present study indicates that decreased PA might be involved in lowering people's motivation. These findings highlight the deleterious nature of stigma experiences, and can also inform public health and intervention efforts to reduce the negative impact of stigma and improve the well-being of affected individuals.

References

Andreyeva, T., Puhl, R. M., & Brownell, K. D. (2008). Changes in perceived weight discrimination among Americans, 1995–1996 through 2004–2006. *Obesity, 16,* 1129–1134. http://dx.doi.org/10.1038/oby.2008.35

Ashmore, J. A., Friedman, K. E., Reichmann, S. K., & Musante, G. J. (2008). Weight-based stigmatization, psychological distress, and binge eating behavior among obese treatment-seeking adults. *Eating Behaviors, 9,* 203–209. http://dx.doi.org/10.1016/j.eatbeh.2007.09.006

Bauer, D. J., Preacher, K. J., & Gil, K. M. (2006). Conceptualizing and testing random indirect effects and moderated mediation in multilevel models: New procedures and recommendations. *Psychological Methods, 11,* 142–163. http://dx.doi.org/10.1037/1082-989X.11.2.142

Brandon, T. H. (1994). Negative affect as motivation to smoke. *Current Directions in Psychological Science, 3,* 33–37. http://dx.doi.org/10.1111/1467-8721.ep10769919

Cooper, M. L., Frone, M. R., Russell, M., & Mudar, P. (1995). Drinking to regulate positive and negative emotions: A motivational model of alcohol use. *Journal of Personality and Social Psychology, 69,* 990–1005. http://dx.doi.org/10.1037/0022-3514.69.5.990

DeLongis, A., Coyne, J. C., Dakof, G., Folkman, S., & Lazarus, R. S. (1982). Relationship of daily hassles, uplifts, and major life events to health status. *Health Psychology, 1,* 119–136. http://dx.doi.org/10.1037/0278-6133.1.2.119

Durso, L. E., & Latner, J. D. (2008). Understanding self-directed stigma: Development of the Weight Bias Internalization Scale. *Obesity, 16,* S80–S86. http://dx.doi.org/10.1038/oby.2008.448

Fox, K., Borer, J. S., Camm, A. J., Danchin, N., Ferrari, R., Lopez Sendon, J. L., . . . the Heart Rate Working Group. (2007). Resting heart rate in cardiovascular disease. *Journal of the American College of Cardiology, 50,* 823–830. http://dx.doi.org/10.1016/j.jacc.2007.04.079

Friedman, K. E., Reichmann, S. K., Costanzo, P. R., Zelli, A., Ashmore, J. A., & Musante, G. J. (2005). Weight stigmatization and ideological beliefs: Relation to psychological functioning in obese adults. *Obesity Research, 13,* 907–916. http://dx.doi.org/10.1038/oby.2005.105

Heron, K. E., & Smyth, J. M. (2010). Ecological momentary interventions: Incorporating mobile technology into psychosocial and health behaviour treatments. *British Journal of Health Psychology, 15,* 1–39. http://dx.doi.org/10.1348/135910709X466063

Hunger, J. M., & Major, B. (2015). Weight stigma mediates the association between BMI and self-reported health. *Health Psychology, 34,* 172–175. http://dx.doi.org/10.1037/hea0000106

Latner, J. D., & Stunkard, A. J. (2003). Getting worse: The stigmatization of obese children. *Obesity Research, 11,* 452–456. http://dx.doi.org/10.1038/oby.2003.61

Latner, J. D., Wilson, G. T., Jackson, M. L., & Stunkard, A. J. (2009). Greater history of weight-related stigmatizing experience is associated with greater weight loss in obesity treatment. *Journal of Health Psychology, 14,* 190–199. http://dx.doi.org/10.1177/1359105308100203

Lyubomirsky, S., King, L., & Diener, E. (2005). The benefits of frequent positive affect: Does happiness lead to success? *Psychological Bulletin, 131,* 803–855. http://dx.doi.org/10.1037/0033-2909.131.6.803

Major, B., Hunger, J. M., Bunyan, D. P., & Miller, C. T. (2014). The ironic effects of weight stigma. *Journal of Experimental Social Psychology, 51,* 74–80. http://dx.doi.org/10.1016/j.jesp.2013.11.009

Myers, A., & Rosen, J. C. (1999). Obesity stigmatization and coping: Relation to mental health symptoms, body image, and self-esteem. *International Journal of Obesity, 23,* 221–230. http://dx.doi.org/10.1038/sj.ijo.0800765

O'Brien, K. S., Latner, J. D., Puhl, R. M., Vartanian, L. R., Giles, C., Griva, K., & Carter, A. (2016). The relationship between weight stigma and eating behavior is explained by weight bias internalization and psychological distress. *Appetite, 102,* 70–76. http://dx.doi.org/10.1016/j.appet.2016.02.032

Pearl, R. L., & Puhl, R. M. (2014). Measuring internalized weight attitudes across body weight categories: Validation of the Modified Weight Bias Internalization Scale. *Body Image, 11,* 89–92. http://dx.doi.org/10.1016/j.bodyim.2013.09.005

Potter, L., Wallston, K., Trief, P., Ulbrecht, J., Juth, V., & Smyth, J. (2015). Attributing discrimination to weight: Associations with well-being, self-care, and disease status in patients with type 2 diabetes mellitus. *Journal of Behavioral Medicine, 38,* 863–875. http://dx.doi.org/10.1007/s10865-015-9655-0

Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interaction effects in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics, 31,* 437–448. http://dx.doi.org/10.3102/10769986031004437

Puhl, R. M., Andreyeva, T., & Brownell, K. D. (2008). Perceptions of weight discrimination: Prevalence and comparison to race and gender discrimination in America. *International Journal of Obesity, 32,* 992–1000. http://dx.doi.org/10.1038/ijo.2008.22

Puhl, R. M., & Brownell, K. D. (2006). Confronting and coping with weight stigma: An investigation of overweight and obese adults. *Obesity, 14,* 1802–1815. http://dx.doi.org/10.1038/oby.2006.208

Raudenbush, S. W., Bryk, A. S., & Congdon, R. (2008). HLM 6.06 for Windows [Computer software]. Skokie, IL: Scientific Software International, Inc.

Schvey, N. A., Puhl, R. M., & Brownell, K. D. (2011). The impact of weight stigma on caloric consumption. *Obesity, 19,* 1957–1962. http://dx.doi.org/10.1038/oby.2011.204

Seacat, J. D., Dougal, S. C., & Roy, D. (2016). A daily diary assessment of female weight stigmatization. *Journal of Health Psychology, 21,* 228–240. http://dx.doi.org/10.1177/1359105314525067

Smyth, J. M., & Heron, K. E. (2012). Health psychology. In M. R. Mehl & T. S. Conner (Eds.), *Handbook of research methods for studying daily life* (pp. 569–584). New York, NY: Guilford Press.

Smyth, J. M., Wonderlich, S. A., Heron, K. E., Sliwinski, M. J., Crosby, R. D., Mitchell, J. E., & Engel, S. G. (2007). Daily and momentary mood and stress are associated with binge eating and vomiting in bulimia nervosa patients in the natural environment. *Journal of Consulting and Clinical Psychology, 75,* 629–638. http://dx.doi.org/10.1037/0022-006X.75.4.629

Suisman, J. L., Slane, J. D., Burt, S. A., & Klump, K. L. (2008). Negative affect as a mediator of the relationship between weight-based teasing and binge eating in adolescent girls. *Eating Behaviors, 9,* 493–496. http://dx.doi.org/10.1016/j.eatbeh.2008.04.001

Tomiyama, A. J. (2014). Weight stigma is stressful. A review of evidence for the cyclic obesity/weight-based stigma model. *Appetite, 82,* 8–15. http://dx.doi.org/10.1016/j.appet.2014.06.108

Vartanian, L. R. (2010). Disgust and perceived control in attitudes toward obese people. *International Journal of Obesity, 34,* 1302–1307. http://dx.doi.org/10.1038/ijo.2010.45

Vartanian, L. R. (2015). Development and validation of a brief version of the Stigmatizing Situations Inventory. *Obesity Science and Practice, 1,* 119–125. http://dx.doi.org/10.1002/osp4.11

Vartanian, L. R., & Novak, S. A. (2011). Internalized societal attitudes moderate the impact of weight stigma on avoidance of exercise. *Obesity, 19,* 757–762. http://dx.doi.org/10.1038/oby.2010.234

Vartanian, L. R., Pinkus, R. T., & Smyth, J. M. (2014). The phenomenology of weight stigma in everyday life. *Journal of Contextual Behavioral Science, 3,* 196–202. http://dx.doi.org/10.1016/j.jcbs.2014.01.003

Vartanian, L. R., & Porter, A. M. (2016). Weight stigma and eating behavior: A review of the literature. *Appetite, 102,* 3–14. http://dx.doi.org/10.1016/j.appet.2016.01.034

Vartanian, L. R., & Shaprow, J. G. (2008). Effects of weight stigma on exercise motivation and behavior: A preliminary investigation among college-aged females. *Journal of Health Psychology, 13,* 131–138. http://dx.doi.org/10.1177/1359105307084318

Watson, D. (1988). Intraindividual and interindividual analyses of positive and negative affect: Their relation to health complaints, perceived stress, and daily activities. *Journal of Personality and Social Psychology, 54,* 1020–1030. http://dx.doi.org/10.1037/0022-3514.54.6.1020

Williams, D. R., Neighbors, H. W., & Jackson, J. S. (2003). Racial/ethnic discrimination and health: Findings from community studies. *American Journal of Public Health, 93,* 200–208. http://dx.doi.org/10.2105/AJPH.93.2.200

Wott, C. B., & Carels, R. A. (2010). Overt weight stigma, psychological distress and weight loss treatment outcomes. *Journal of Health Psychology, 15,* 608–614. http://dx.doi.org/10.1177/1359105309355339

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