DO PSYCHOLOGICAL DISTRESS AND MALADAPTIVE EATING PATTERNS MEDIATE THE RELATIONSHIP BETWEEN OVERT WEIGHT STIGMA AND WEIGHT LOSS TREATMENT OUTCOMES?

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Prevalence rates of overweight and obesity continue to rise and the majority of Americans are considered either overweight or obese (Flegal, Carroll, Ogden & Johnson, 2002). Although overweight and obesity are common phenomena, anti-fat bias is pervasive and results in overt discrimination and stigma towards overweight and obese individuals (Puhl & Brownell, 2001). Evidence suggests that experiencing overt weight-based stigma is associated with greater depression, binge eating behaviors and body image dissatisfaction (e.g., Ashmore, Friedman, Reichmann & Musante, 2008; Jackson, Grilo & Masheb, 2000; Matz, Foster, Faith & Wadden, 2002). Additionally, a small body of research indicates that overt stigma (i.e., stigmatizing situations) may negatively influence health behaviors that are consistent with weight loss (e.g., Vartanian & Shaprow, 2008). The current investigation assessed whether the relationship between encountering stigmatizing situations in the past and weight loss outcomes in a behavioral weight loss program were mediated by psychological distress (i.e., depression, negative affectivity and body image dissatisfaction) and maladaptive eating patterns (i.e., binge eating). There was no evidence for the hypothesized mediation, however, stigmatizing experiences were significantly associated with weight loss treatment outcomes such as percent weight loss during the intervention, average caloric intake and caloric expenditure through physical activity. Additionally, stigmatizing experiences were significantly associated with increased reports of depression, binge eating, negative affectivity, and poorer body image. These findings support the need for interventions designed to reduce the harmful impact of overt weight stigma on the psychological well-being and health of overweight/obese adults.
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Overweight and obesity are prevalent in today’s society. Over 64% of Americans are overweight (i.e., BMI >25), over 30% are considered obese (i.e., BMI >30; Flegal, Carroll, Ogden & Johnson, 2002), and rates show little evidence for a reversal of these trends. Although overweight and obese individuals comprise more than half of all American adults, individuals who are overweight or obese are regular targets of negative stereotypes, discrimination and bias (e.g., Carr & Friedman, 2005; Fabricatore & Wadden, 2004; Puhl & Brownell, 2001). In fact, overweight and obese individuals are viewed as “one of the last acceptable targets of stigma and discrimination” (Puhl & Brownell, 2001, pg. 788).

The current study sought to examine whether experiencing weight-related stigmatizing in the past had a detrimental impact on weight loss and weight loss behaviors in overweight and obese treatment-seeking adults, and whether psychological distress, maladaptive eating behaviors, and poor body image mediated the relationship between stigmatizing experiences and weight loss treatment outcomes.

**Weight Stigma**

Stigma has been described as the bias and discrimination that stems from negative beliefs about, and attitudes toward, a group that is devalued or perceived as inferior to the society as a whole (Crocker & Major, 1989). In other words, stigma is the manifestation of society’s negative perceptions towards a specific group (Puhl & Brownell, 2003). Stigma is present for many different attributes/conditions including race and ethnicity (e.g., Brigham, 1974; Sellers & Shelton), physical and cognitive disabilities (e.g., Newman, 1976; Susman, 1994), HIV status (e.g., Parker & Aggleton, 2003), and sexual orientation (e.g., DeCecco, 1984; Herek & Capitanio, 1999). While the stigma for overweight and obesity shares features with other stigmatized groups, it is also unique. For example, comparable to race or physical disabilities,
obesity is immediately visible. However, unlike race and physical disability, obesity is viewed as a controllable condition (Weiner, Perry & Magnusson, 1988). Similarly, as noted above, comparable to contracting HIV, becoming obese is often viewed to be within the person’s control, however, obesity is more immediately visible than HIV status (Crocker, Cornwell & Major, 1993). Thus, because overweight/obesity is a highly visible characteristic that is believed to be within a person’s control, this often makes obese people open targets for overt discrimination.

Etiological and Ideological Correlates of Weight Stigma

Because weight is believed to be highly controllable, attributions of control and responsibility are central features of weight-based stigmatization (Crandall & Martinez, 1996). Attribution Theory has been proposed as a partial explanation for the current pervasive anti-fat bias and stigma towards overweight and obese persons. While Attribution Theory does not explain why overweight and obese individuals initially became targets for stigma, it offers a partial explanation for the subsequent blaming and poor treatment of the obese. Attribution Theory asserts that, when encountering a stigmatized person (i.e., obese person), individuals attempt to determine the target’s responsibility for the negative condition. If the stigmatized characteristic is perceived to be personally controllable, blame may occur because the target is believed to be responsible for the negative condition. Since the obese person is viewed as bringing this condition upon him/herself, bias and overt acts of discrimination towards that person are justified (Crandall, 2000; Crandall et al., 2001).

Beyond attributions of control and responsibility, anti-fat bias also has been linked to ideological beliefs, such as the belief in a just world, which is the belief that people get what they deserve (Crandall, 1994), and the Protestant Work Ethic, which is the belief that hard work,
determination and self-control lead to success (Crandall, 2000). It appears that people who hold these etiological beliefs infer that obese persons in some “cosmic” way deserve their negative plight and therefore, at least indirectly, deserve prejudice and stigma (Crandall, 2001). These etiological beliefs are also associated with greater internalized weight bias in overweight and obese individuals (i.e., rating obese individuals more negatively than normal weight people, and implicitly associating “fat people” with “bad”; Carels et al., in press). In fact, obesity has been described as a “character stigma” that deserves shame and guilt because it results from a moral failure (Allon, 1982). Research supports this notion, and indicates that people who possess negative characteristics that are perceived as controllable, such as overweight and obesity, are responded to with greater dislike, anger, and decreased sympathy (Weiner, Perry & Magnusson, 1988). Conversely, if a person is not judged to be responsible for his/her stigmatizing condition, that person receives sympathy, pity and social acceptance (i.e., physical disability; Crandall, 1996).

Americans do in fact endorse beliefs that overweight people lack willpower and are at fault for their weight (Crandall & Martinez, 1996). Importantly, when evidence is presented confirming the belief that obese people are in control of their weight (i.e., experimental manipulation providing “evidence that obesity is a behavioral problem), the anti-fat bias is strengthened (Teachman et al., 2003). Thus, Attribution Theory provides a strong conceptual model for weight stigma and bias. Because overweight and obesity are perceived to be controllable conditions, those who are overweight or obese are believed to simply lack the willpower and self-control necessary to improve their condition. Stigma toward the overweight and obese is justified because of this attribution, combined with ideological beliefs such as the Protestant Work Ethic and a belief in a “just world.” When stigma is justified, overt acts of
discrimination (i.e., stigmatizing situations/experiences) are likely to occur. In fact, weight biases often translate into overt acts of discrimination and bias, which will be described in detail below (e.g., Carr & Friedman, 2005). The current investigation is concerned with the effects of these stigmatizing overt acts on overweight and obese individuals attempting to lose weight. For the purpose of the current study, the term “stigmatizing experiences” will be used when discussing these overt, harmful acts/situations.

Evidence for Weight Stigma and Stigmatizing Experiences

Despite the fact that most Americans are overweight or obese, implicit and explicit anti-fat bias is evident in children as young as three years of age (see Note 1 for an explanation of implicit and explicit stigma). For example, preschool children were significantly more likely to attribute negative characteristics to a picture of an overweight child than a normal weight child and were significantly more likely to choose a picture of a thin child for a playmate than a picture of an overweight child (Cramer & Steinwert, 1998). Even more concerning, evidence suggests that stigmatization towards obese individuals steadily rises as children age (Sigelman, Miller & Whitworth, 1986). In Cramer and Steinwert (1998) noted above, bias was evident in three-year-old participants, but was greater in four- and five-year-olds. In one classic study, “Lazy,” “stupid,” “dirty,” and “ugly” were phrases used by 6-year-old children to describe silhouettes of an overweight child (Staffieri, 1967). In another classic study, children were asked to rate how much they liked six drawings of children, including one obese child, and four with physical disabilities. The drawing of the obese child was consistently rated last (Richardson, Goodman, Hastorf & Dornbusch, 1961), regardless of SES and ethnic background.

Research also suggests that weight bias may be more severe today than in the past. In a replication of an earlier investigation, Latner and Stunkard (2003) asked 455 fifth and sixth grade
children to describe the same silhouettes that were presented by Richardson, Goodman, Hastorf and Dornbush (1961). The findings indicated that the bias against obese children was even stronger than in the original investigation.

Weight stigma and discrimination are pervasive throughout many life domains, and have been reported in the workplace, home, school, medical and social environments (e.g., Puhl & Brownell, 2001; Puhl, Moss-Racusin & Schwartz, 2007). Obese individuals are less likely to be hired for employment (Klesges et al., 1990), recommended for promotions (Bordieri, Drehmer & Taylor, 1997), and receive less favorable performance reviews at work (Paul & Townsend, 1995; Rothblum, Miller & Garbutt, 1988). They are described by co-workers and supervisors as less productive, ambitious, and disciplined (Larkin & Pines, 1979). In addition, obese employees’ wages are less than their normal weight counterparts. One longitudinal study found that obese women earned 12% less than non-obese women (Register & Williams, 1990).

Overweight and obese persons are at a disadvantage in educational settings as well. In an examination of high school students applying for college, obese students were significantly less likely to be accepted to college than their normal-weight peers (Canning & Mayer, 1966). Another more recent investigation discovered that normal-weight students receive more financial support from their families than overweight students (Crandall, 1991). Significant stigma is also prevalent in the classroom setting. When asked to report their beliefs about obese persons, a number of high school teachers reported that obese people are untidy, less likely to succeed at work, and are undesirable marriage partners (Neumark-Sztanier, Story & Harris, 1999).

Weight stigma is also pervasive in the medical community. In a study of medical students, common adjectives used to describe obese persons included “bad,” “ugly,” “awkward,” “unsuccessful” and “lacking self-control” (Blumberg & Mellis, 1980). Family physicians
associate obesity with poor hygiene, noncompliance and dishonesty (Klein, Najman, Kohrman & Munro, 1982). Even more disturbing is the widespread stigma among health professionals that treat obesity (e.g., McArthur & Ross, 1997). For example, Oberrieder, Walker, Monroe and Adeyanju (1995) found negative attitudes toward the obese in both dietetic students and registered dieticians. Even when explicit bias (i.e., bias that is consciously acknowledged) is minimal, implicit weight bias (i.e., bias that individuals are either unwilling or unable to report) is commonly present. While there was little evidence for explicit bias against the overweight/obese (i.e., few endorsements of overweight persons as bad), in an investigation of 84 health care specialists (72% physicians), there was strong evidence for an implicit bias against overweight persons (i.e., the belief that overweight people are bad and lazy; Teachman & Brownell, 2001). This study brings recognition that medical professionals are not immune from direct bias against overweight and obese people.

Weight–based bias and stigma are overt, and result in poor and/or unfair treatment of overweight/obese persons. Obese individuals are aware of this bias and report being regular targets of stigma. Common stigmatizing situations for overweight and obese individuals include: people making unflattering assumptions about obese persons, encountering physical barriers, being avoided, ignored or excluded because of weight, and receiving hurtful comments from children, family, and medical professionals (e.g., Friedman et al., 2005). In a study of 987 people (187 men, 800 women), about 20% of all respondents, including those who were normal-weight, reported weight-related mistreatment. The perceived mistreatment steadily increased with increasing weight. For overweight respondents with a mean BMI of 28.3, 24.7% reported mistreatment due to their weight, and for obese respondents with an average BMI of 35.7, 42.5% reported weight-related mistreatment (Falkner et al., 1999).
While overweight and obese individuals experience widespread stigma and discrimination, unlike other stigmatized groups who identify with group members and show in-group favoritism (e.g., racial and ethnic groups), overweight and obese individuals appear to internalize weight stigma and hold both implicit and explicit negative weight bias (e.g., Schwartz, Vartanian, Nosek & Brownell, 2006; Wang, Brownell & Wadden, 2004). For example, Schwartz and colleagues (2006) discovered that obese respondents had implicit anti-fat biases, and there was no evidence of in-group favoritism or a “pro-fat bias” in obese respondents. Overweight and obese respondents implicitly preferred thin people to fat people and held the implicit stereotype that fat people are lazy in comparison to thin people. In another investigation, obese women who experienced rejection in an interpersonal interaction blamed their weight for the rejection (Crocker, Cornwell & Major, 1993). The authors described that self-blame may occur because, just like society as a whole, overweight and obese individuals see their weight as personally controllable, blame themselves for their excessive weight (Crocker, Cornwell & Major, 1993), and subsequently believe they deserve rejection and prejudice (Crocker & Major, 1994). As Crandall (1994) noted, overweight and obese persons lack the protective in-group favoritism that is seen in other stigmatized groups. Thus, overweight and obese individuals appear to internalize negative stereotypes, hold anti-fat biases and blame themselves for their excess weight.

**Stigmatizing Experiences, Psychological Distress and Maladaptive Eating Patterns**

Given that weight stigma and discrimination are pervasive, and overweight and obese individuals appear to internalize these negative stereotypes and beliefs, attributing their weight to personal inadequacy or lack of willpower, one would expect that weight stigma and discrimination would have detrimental effects on the psychological well-being of overweight and
obese adults. Evidence suggests that there is a strong association between weight stigma and psychological distress. For example, a history of being teased about their appearance during childhood was significantly related to poor self-esteem and depression in obese adult women (Jackson, Grilo & Masheb, 2000). In a sample of 93 adults seeking weight loss treatment, self-reported stigmatizing experiences were significantly related to depressive symptomatology after controlling for age, gender, BMI and age of onset of obesity (Friedman et al., 2005). In Class III obese persons (i.e., BMI > 40) seeking surgical weight loss treatment, the experience of weight stigma also significantly predicted higher levels of depression, accounting for over 32% of the variance in reported depression (Chen et al., 2007). Additionally, frequency of stigmatizing situations in the past was significantly associated with an increase in reported mental health symptoms in a group of 146 obese individuals (Myers & Rosen, 1999). Importantly, the effects of weight were controlled for in this investigation, indicating that stigmatizing experiences, not current weight status, directly influenced psychological adjustment. Finally, high prevalence rates of depression have been observed in obese individuals reporting significant weight-related psychosocial problems (Karlsson et al., 2003). Thus, evidence suggests that psychological distress is a common outcome for overweight and obese individuals exposed to weight-based stigma. Although research has yet to examine the exact nature of the causal pathway between weight stigma and psychological distress (i.e., stigmatizing situations directly cause distress or stigmatizing experiences lead to internalized weight-bias, which leads to distress), being the target of stigma is detrimental to the psychological well-being of overweight and obese individuals.

In addition to the effects on psychological well-being, stigmatizing experiences have also been connected to maladaptive eating patterns. For instance, adult women who reported being
teased during adolescence about their weight or size reported elevated levels of eating disturbances (Thompson, 1991). Fairburn and colleagues discovered that people diagnosed with binge eating disorder were significantly more likely to report teasing and negative comments about their weight from family members than a control group (Fairburn et al., 1998). In a sample of 93 individuals seeking weight loss treatment, self-reported stigmatizing experiences (i.e., people making unflattering assumptions about obese people, encountering physical barriers, being avoided, excluded or ignored because of weight, receiving hurtful comments from children, etc.) predicted binge eating behavior, accounting for 20% of the variance (Ashmore, Friedman, Reichmann & Musante, 2008). Strikingly, 98% of participants reported that they had received hurtful comments from others, and 89% reported that their family members made disparaging comments towards them. The painful stigmatizing experiences that overweight and obese individuals experience appear to increase maladaptive eating behaviors such as binge eating.

Stigmatizing experiences are also harmful to overweight and obese individuals’ satisfaction with their physical appearance. Evidence suggests that stigmatizing experiences have a long-lasting, detrimental impact on body image. For example, the frequency of being teased as a child about weight was positively correlated with body dissatisfaction (Grilo, Wilfley, Brownell & Rodin, 1994) and concerns about weight as an adult (Jackson, Grilo & Masheb, 2000). Although overweight and obese individuals report poorer body image than normal weight individuals (e.g. Cash, Winstead & Janda, 1986; described below), experiencing weight stigma uniquely impacts body image. In a longitudinal study of adolescents, Thompson and colleagues (1995) discovered that the association between weight and body image dissatisfaction was mediated by teasing experienced as a youth. Similarly, appearance-based teasing occurring in
adolescence significantly predicted body dissatisfaction in a group of adult women (Cash, Winstead & Janda, 1986).

Just as overt bias and stigma encountered as a child and adolescent harms body image, stigmatizing experiences occurring in adulthood also appear to detrimentally affect body image. For instance, a study of 79 overweight and obese women participating in behavioral weight loss interventions found that experiencing teasing as an adult significantly predicted current body image dissatisfaction (Matz, Foster, Faith & Wadden, 2002). Stigmatizing experiences such as being teased or hearing negative comments about one’s size, shape or appearance are detrimental to overweight and obese individuals’ perceptions and acceptance of their physical appearance.

Clearly, experiencing overt stigma is harmful to overweight and obese individuals’ psychological well-being and eating patterns. However, the outcomes of being stigmatized, such as psychological distress, poor body image and maladaptive eating patterns, may adversely influence one’s ability to successfully lose weight. The relationships between these variables and weight loss outcomes will be discussed in detail below.

*Psychological Distress, Binge Eating, Body Image Dissatisfaction and Weight Loss Outcomes*

Overweight and obese individuals report decreased quality of life and/or more limitations in numerous domains including physical functioning, general health perception, social functioning, vitality, and bodily pain (Fontaine & Bartlett, 1998; Fontaine, Cheskin & Barofsky, 1996). While research regarding the positive relationship between depression and obesity in the general population is equivocal (e.g., Friedman & Brownell, 1995; Roberts et al., 2000), evidence suggests that treatment-seeking obese individuals have significantly elevated psychopathology compared to normal weight persons (e.g., Fitzgibbon, Stolley & Kirschenbaum, 1993; Werrij, Mulkens, Hospers & Jansen, 2005). In fact, one investigation found rates of mood
disorders in an obese, treatment-seeking sample that were five times higher than rates in community norms (Goldsmith et al., 1992). Another study found that 44% of all participants registering for a weight loss treatment program reported depressive symptoms (Werrij, Mulkens, Hospers & Jansen, 2005).

Depression appears to negatively influence weight loss treatment outcomes. It has been suggested that the psychological consequences of obesity, such as depression, may prevent successful emotion regulation, which in turn promotes increased eating (Schwartz & Brownell, 2004). In fact, individuals reported eating more high fat, high carbohydrate foods during depressive episodes (e.g., Fernstrom, 1989). Similarly, individuals seeking weight loss treatment reported heightened levels of depression and eating in response to negative emotions (McReynolds, 1983; Rodin, Schhank & Striegel-Moor, 1989). Finally, studies of individuals who regained weight after successfully losing weight indicated they had poorer coping mechanisms and tended to use food when experiencing negative or stressful situations (Gormally & Rardin, 1981), or used food as a source of comfort (Kayman, Bruvold & Stern, 1990). It is difficult to maintain a caloric deficit necessary for weight loss or caloric balance necessary for weight maintenance while consuming high fat foods or when using food as a source of comfort.

Evidence also suggests that depression is associated with poorer weight loss in structured weight loss investigations. Linde and colleagues (2004) discovered that women who were managing their depression through medication lost less than half the amount of weight as women who were not taking medication for depression. Although it could be argued that the lower weight loss was a result of side effects of the medication versus the depressive symptoms, another investigation found that individuals with higher levels of self-reported psychopathology (including global distress symptoms) lost half as much weight in a structured weight loss
program than individuals reporting lower levels (Beliard, Kirschenbaum & Fitzgibbon, 1992). Moreover, depression also predicts attrition in weight loss programs (e.g., Clark, Niaura, King & Pera, 1996). Depressive symptoms not only predict poorer initial weight loss and attrition, but also predict poorer weight loss maintenance, and unhealthy eating patterns. For example, in an adult sample, weight “regainers” (i.e., lost at least 10% of their body weight, but regained weight) reported eating to distract themselves from their negative thoughts and moods (Byrne, Cooper & Fairburn, 2003). Additionally, depressive symptoms predicted weight regain one year following successful weight loss (McGuire et al., 1999) and were associated with maladaptive eating patterns in adolescent females (Attie & Brooks-Gunn, 1989). It is plausible that individuals with depressive symptoms and poor coping skills rely on food to manage their emotions, and this pattern is detrimental to long-term weight loss.

The relationship between negative affectivity, which includes subjective distress and unpleasant mood states, and weight loss outcomes has not been directly assessed. However, negative affectivity consistently predicts depressive symptoms (Dyck, Jolly & Kramer, 1994), and it is likely that the relationship between negative affectivity and weight loss outcomes would mimic those observed for depression. The current investigation sought to address the scarcity of research on this topic and provide information regarding the relationship between negative affectivity and weight loss treatment outcomes.

Just as depression and negative affectivity are common features in overweight and obese treatment-seeking individuals, evidence suggests that binge eating is also a common occurrence in this population. Grissett and Fitzgibbon (1996) found that 75% of a sample of 192 obese individuals seeking weight loss treatment reported engaging in binge eating, and 38% met the full diagnostic criteria for binge eating disorder. Prevalence rates of binge eating disorder
commonly range from about 10-30% of obese individuals seeking weight loss treatment (de Zwaan & Mitchell, 1992; Spitzer et al., 1992). Similar to the findings mentioned above, it would be expected that a significant portion of overweight and obese individuals seeking weight loss treatment engage in sub-clinical binge eating. Importantly, binge eating is associated with a greater degree of overweight in treatment seeking populations (Telch, Agras & Rossiter, 1988).

Binge eating negatively influences weight loss outcomes. For example, obese individuals who reported binge eating were significantly more likely to report emotional eating, social eating and a decreased ability to resist temptation (Grissett & Fitzgibbon, 1996). Binge eaters in a behavioral weight loss program reported using significantly fewer recommended strategies for weight loss, and were less likely to choose lower calorie food items for meals and snacks than those who did not report binge eating (Marcus, Wing & Hopkins, 1988). In addition, individuals with binge eating disorder consumed more calories at meals, regardless of whether the meal is considered a binge (Guss et al., 2002; Yankovski, 2002). Since reduced caloric consumption is a critical component of successful weight loss and weight loss maintenance, it may be more difficult for binge eaters to create a large enough caloric deficit for substantial weight loss. Additionally, binge eaters experience higher levels of psychological distress than their nonbinging counterparts (e.g., Kuehnel & Wadden, 1994). Because psychological distress and binge eating are associated with behaviors that are inconsistent with successful weight loss, it may be extremely difficult for overweight and obese individuals who binge and experience psychological distress to lose weight.

While some research suggests that there is no relationship between binge eating and weight loss during structured weight loss interventions (e.g., Gladis et al., 1998), other research indicates that binge eating is predictive of poorer weight loss (e.g., Agras et al., 1997).
Additionally, there is widespread evidence indicating that overweight and obese individuals who binge eat or have binge eating disorder have higher attrition rates and weight regain than individuals who do not binge (Marcus, Wing & Hopkins, 1988; McGuire et al., 1999; Teixeira et al., 2004; Yanovski et al., 1994; Yanovski, 2002). For example, after successfully losing weight, those who regained weight at a one-year follow-up reported significantly more dietary disinhibition and binge eating (McGuire et al., 1999), and reported binge eating at baseline was predictive of attrition in a sample of 44 women (Sherwood, Jeffery & Wing, 1999). Thus, binge eating negatively impacts weight loss in various ways. Binge eating increases the likelihood of engaging in behaviors inconsistent with successful weight loss (e.g., emotional eating), may decrease weight loss during structured weight-reduction programs, and is detrimental to weight loss maintenance and treatment adherence.

In addition to depression, negative affectivity, and binge eating, overweight and obese individuals are also susceptible to body image dissatisfaction. Body image is defined as an individual’s perceptions of his/her physical appearance, and it is shaped by both the individual and reactions of others. Due to the stringent standard of thinness in American culture, it is not surprising that 52% of men and 66% of women report dissatisfaction about their weight (Garner, 1997). Elevations in body image dissatisfaction occur as weight increases, and body image dissatisfaction is more prevalent among obese than non-obese individuals (Cash, Winstead & Janda, 1986). Research suggests that obese individuals may overestimate the size of their bodies and are more dissatisfied with their appearance than their normal weight counterparts (Collins, McCabe, Jupp & Sutton, 1983). In a study of 110 individuals seeking weight loss treatment, degree of obesity was significantly correlated with body image satisfaction \((r = -.26)\), such that a higher BMI was associated with lower body satisfaction (Friedman et al., 2001).
Similarly, Sarwer, Wadden and Foster (1998) discovered that obese women have higher body image dissatisfaction than nonobese women, and obese women were more dissatisfied with both specific and global aspects of their appearance.

Similar to depression, negative affectivity, and binge eating, body image dissatisfaction negatively influences weight loss outcomes. For example, body image dissatisfaction reported at the onset of a 24-week behavioral weight loss program (BWLP) was negatively correlated with weight loss during the program (Taverso et al., 2000). Similarly, increased body image dissatisfaction at baseline was associated with less weight loss in a sample of 158 women participating in a BWLP (Texeira et al., 2004). Body image dissatisfaction not only influences weight loss itself, but appears to influence the factors associated with successful weight loss, such as eating behaviors and attrition in behavioral weight loss programs. For example, overweight women who dropped out of a weight loss program overestimated their body size to a greater degree than those who completed the program (Collins, McCabe, Jupp & Sutton, 1983). In other words, those women who completed the weight loss intervention had a more accurate perception of their physical appearance, while those who dropped-out before completion were women who perceived their bodies inaccurately and negatively. Body dissatisfaction is also associated with eating dysfunction (i.e., pathological avoidance of food, compulsive eating, and bulimic behaviors; Attie & Brooks-Gunn, 1989). Additionally, body image distress has been linked to binge eating and binge eating disorder (e.g., Eldredge & Agras, 1996; Willey, Schwartz, Spurrell & Fairburn, 2000), which negatively impact weight loss outcomes. Thus, similar to psychological distress and binge eating, body image dissatisfaction appears to be detrimental to weight loss and weight loss behaviors.
Weight Stigma and Health Behaviors

Just as depression, negative affectivity, binge eating, and poor body image negatively influence weight loss and weight loss behaviors, weight stigma may also impact health behaviors. As described above, anti-fat biases are common among health-care professionals, even those specializing in obesity (e.g., Teachman & Brownell, 2001). Overweight and obese individuals may be reluctant to obtain necessary medical care because of the pervasive negative attitudes and biases within the medical community. Although the direct influence between perceived weight stigma and health care avoidance has not been examined, research with other stigmatized groups suggests that there may be a link between bias in the medical community and health care usage. For example, in a sample of gay and bisexual men who had not been tested for HIV, 36% reported that they avoided testing because they were fearful the subsequent discrimination that would occur if others knew they underwent testing (Weitz, 1991). Similarly, obese individuals may be less likely to obtain necessary medical care due to the stigma occurring within the medical profession (Rand & MacGregor, 1990). Evidence suggests that overweight individuals cancel more medical appointments than normal weight persons (Olson, Schumaker & Yawn, 1994). One investigation discovered that as weight increased, women were more reluctant to obtain an annual pelvic examination (Adams, Smith, Wilbur & Grady, 1993). In obese women, this reluctance translated into a decreased likelihood of receiving annual pelvic exams. Another large-scale study of 7,000 women found that increased BMI was associated with decreased participation in preventative care, such as breast exams (Fontaine, Faith, Allison & Cheskin, 1998). Furthermore, in a sample of 222 women, increased weight was associated with increased rates of delay and avoidance of health care (Alegria-Drury, Louis, 2002).
In addition to health care avoidance, there is a small body of research suggesting that individuals who experience weight stigma are less likely to engage in behaviors that are necessary for weight loss and weight management. For example, in a sample of 222 adults, 80% of females and 79% of males reported increased eating as a method for coping with weight stigma (Puhl & Brownell, 2006). Common coping responses in another investigation of 146 individuals seeking weight loss through surgical or behavioral methods indicated that eating and refusing to diet were common coping responses to stigmatizing experiences (Myers & Rosen, 1999).

Weight stigma also appears to detrimentally influence exercise participation. Criticism about weight during physical activity has been associated with decreased sports enjoyment and a reduction in physical activity in children (Faith et al., 2002). In a sample of 100 female undergraduate students, participants who experienced more weight stigma were less satisfied with their bodies and reported higher motivation to avoid exercise (Vartanian & Shaprow, 2008). However, in this investigation, weight stigma was not directly associated with exercise behaviors. The investigators hypothesized that experiencing stigma results in psychological distress which could lead to behaviors that decrease the likelihood of weight loss and weight maintenance. Similarly, in a review of the literature on stigma and obesity, Puhl and Brownell (2003) noted that the psychological consequences of stigma (e.g., social withdrawal, etc.) may increase the likelihood of overeating and sedentary activity.

There has been little research directly examining weight stigma and weight loss outcomes. In the one notable exception, internalized weight bias in a group of treatment-seeking overweight and obese individuals influenced weight loss treatment outcomes (Carels et al., in press). Internalized weight bias was associated with poorer self-monitoring, greater caloric
intake, decreased energy expenditure, and decreased exercise in a sample of 47 overweight and obese adults. Internalized bias was also associated with poorer weight loss during the first six weeks of the intervention. While this study provided insight into the relationship between internalized weight stigma and weight loss outcomes, no studies have yet to examine the relationship between overt, stigmatizing experiences and weight loss outcomes.

The purpose of the current investigation is to fill in this “gap,” and examine how stigmatizing experiences influence weight loss outcomes. The current study sought to directly examine these hypotheses by assessing whether psychological distress and maladaptive eating patterns mediate the relationship between stigmatizing experiences and weight loss and weight loss behaviors. Specifically, the current investigation assessed whether depression, negative affectivity, binge eating, and/or body image dissatisfaction mediated the relationship between past stigmatizing experiences and weight loss treatment outcomes (i.e., weight loss, caloric intake, and caloric expenditure) in a behavioral weight loss program.

**Hypotheses**

In a review of the literature on stigma and obesity, Puhl and Brownell (2003) noted that the psychological consequences of stigma (e.g., social withdrawal, etc.) may increase the likelihood of overeating and sedentary activity. Thus, it was hypothesized that the relationship between stigmatizing experiences and treatment outcomes in a behavioral weight loss program (BWLP; i.e., caloric intake, weight loss, caloric expenditure) would be mediated by psychological distress variables (i.e., depression, negative affectivity, body image dissatisfaction) and maladaptive eating patterns (i.e., binge eating). More specifically, it was hypothesized that self-reported stigmatizing experiences would be significantly related to self-reported depression, negative affectivity, binge eating, and body image dissatisfaction at the onset of a BWLP.
Additionally, it was hypothesized that higher levels of reported depression, negative affectivity, binge eating, and body image dissatisfaction would negatively influence weight loss treatment outcomes. Similarly, it was hypothesized that more frequent stigmatizing experiences reported at baseline would be associated with poorer weight loss treatment outcomes. Finally, it was hypothesized that the relationship between stigmatizing experiences and weight loss treatment outcomes would be mediated by self-reported depressive symptoms, negative affectivity, binge eating, and body image dissatisfaction.

Methods

Participants

The data in the current investigation were collected as part of a larger intervention (described below; See Note 2). Fifty-five overweight and obese individuals (i.e., BMI ≥ 27) were recruited for this 14-week behavioral weight loss intervention. Participants were recruited through local advertisements (e.g., newspapers), word of mouth from participants in previous behavioral weight loss programs, and campus email. Individuals were eligible for participation if they were: a) overweight or obese (BMI ≥ 27 kg/m²); b) sedentary (i.e., not engaged in a physical activity program two or more times per week for at least 20 minutes per session); c) willing to accept random assignment; d) non-smokers; e) able to provide informed consent; and f) approved for participation by their primary care physician. Participants were excluded from the study if they had one or more of the following: a) past or current cardiovascular disease (e.g., myocardial infarction or stroke) determined from medical history; b) musculoskeletal problems that would prevent participation in moderate levels of physical activity (e.g., self-reported osteoarthritis); c) a self-reported history of insulin dependent diabetes; d) resting blood pressure greater than 160/100 mgHg (self-reported); or d) life limiting illness including cancer, renal
dysfunction, hepatic dysfunction or dementia. All procedures received human subjects review board approval and were followed without deviation.

Fifty-five participants were recruited for the 14-week intervention. In this investigation, participants’ mean age was 47.4 (SD = 11.7; range: 25-73) years. The majority of the participants were Caucasian (89%), female (81.8%), and married or living with a partner (69.1%). Annual income exceeded $30,000 for approximately 76% of participants, and approximately 86% had at least a baccalaureate degree. Mean weight at baseline was 239.0 pounds (SD = 55.6; range: 163.8-388.4), and mean BMI at baseline was 37.2 (SD = 6.7; range: 27.4-56.0).

**Study Design**

The data collected in this study were part of a larger investigation on weight loss and physical activity in which half of the participants were randomly assigned to a traditional behavioral weight loss program (i.e., LEARN program; described below) or a newly developed behavioral weight loss program focused on habit formation/disruption, enhancing motivation, and environmental modification (i.e., Transforming Your Life program; described below). Before participants began the weight loss intervention, they completed assessments of height and body weight. Additionally, participants completed a variety of questionnaires at the beginning of the intervention including the Stigmatizing Situations Inventory (SSI; Myers & Rosen, 1999), the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977), the Binge Eating Scale (BES; Gormally, Black, Daston & Rardin, 1982), and the Appearance Evaluation and Appearance Orientation subscale of the Multidimensional Body-Self Relations Questionnaire-Appearance Scales (MBSRQ-AS; Cash & Winstead, 1986).
**Intervention**

Participants were randomized into one of two 14-week BWLPs. Participants met weekly for 75-minute sessions and were weighed at the end of each session. Half of the participants were randomized into a modified version of the LEARN weight loss program (Brownell, 2000). The LEARN program is an empirically supported approach to weight management and physical activity that includes five components: Lifestyle, Exercise, Attitudes, Relationships, and Nutrition (Wadden, Foster, & Letizia, 1994). The goals of the program are to achieve weight loss by gradually increasing energy expenditure through physical activity while progressively decreasing energy intake through permanent lifestyle changes. The program emphasized these components: a) self-monitoring of eating behavior, b) controlling stimuli associated with eating, c) physical activity, d) nutrition education, e) modifying self-defeating thoughts and negative emotions associated with dieting and body image, f) setting realistic goals, g) relationships, and h) relapse prevention and weight maintenance. Additional information on the LEARN program can be found at the website [www.thelifestylecompany.com](http://www.thelifestylecompany.com).

The remaining half of the participants were randomized into the Transforming Your Life (TYL) program which is a newly developed BWLP which focuses on helping individuals adopt and maintain healthy eating and physical activity behaviors in the midst of the current “obesogenic” environment. This program applies theoretical and empirical research on habit formation (Ouellette & Wood, 1998; Wood & Quinn, 2005), automotive theory (Bargh & Chartrand, 1999), and motivation enhancement through social comparison (Wheeler & Suls, 2005) and self-regulatory focus (Higgins, 2000) to weight loss.

The TYL program emphasized these components: a) healthy habit formation (i.e., establishing routines, minimizing disruptions, rewarding the habit, forming implementation
intentions, and assessing confidence), b) unhealthy habit disruption (i.e., identification and removal of triggers for unhealthy habit, change/disruption of routines, making unhealthy habit less rewarding, forming implementation intentions to avoid the unhealthy habit, and assessing confidence), c) maintaining and enhancing motivation for healthy eating and physical activity through social comparison and self-regulatory focus, d) decreasing exposure to environmental stimuli that encourage unhealthy eating and a sedentary lifestyle, and e) increasing exposure to environmental stimuli that encourage healthy eating and an active lifestyle. Consistent with the LEARN program, the goals of the Transforming Your Life program were to achieve weight loss by gradually increasing energy expenditure through physical activity while progressively decreasing energy intake.

A clinical health psychologist and a graduate student in clinical psychology, or two upper-level graduate students in clinical psychology (including the PI from the current investigation), administered the weekly sessions of both BWLPs in small groups (i.e., about 10-15 participants).

*Measures*

*Demographic variables.* Participants completed a questionnaire (Appendix A) at the onset of the intervention assessing age, race/ethnicity, marital status, income, and education.

*Assessment of body weight and body composition.* Body weight was assessed at the onset of the intervention and on a weekly basis at the end of each session using a digital scale (BF-350e, Tanita, Arlington Heights, IL) to the closest 0.1 lb. Height was measured in inches to the closest 0.5 inch using a standard balance beam scale height rod at the start of the intervention. Height and weight were converted to kilograms and meters to calculate BMI (kg/m²). Although change in body weight is commonly used to measure weight loss success (Jeffery et al., 2000),
weight loss expressed as a percentage of initial body weight reduces the likelihood that heavier participants will be categorized as more successful while losing a smaller percentage of their total body weight than lighter participants. In this study, percent change in body weight was used for all analyses and was defined as the percent change in body weight from the pre-intervention assessment to the weight at the end of the intervention.

Energy expenditure. Caltrac accelerometers were used to assess total daily energy expenditure. The Caltrac accelerometer, which measures vertical acceleration and converts the measurement into an energy expenditure value, provides a reliable assessment of total energy expenditure (Fehling, Smith, Warner & Dalsky, 1999; Pambianco, Wing & Robertson, 1999). Participants were asked to self-report the type and duration of their daily purposeful physical activity (i.e., not including activity associated with daily living, such as occupational exertion or taking the stairs), and energy expenditure (accelerometer readings for total energy expended (kcal) during consecutive 24 hour periods).

Self-monitoring. Throughout the intervention, participants recorded their food consumption in daily food diaries to assess caloric intake. Although underreporting of dietary intake is common, food diaries can provide reasonably reliable estimates of habitual energy intake (Gay, 2000). During a group orientation session, common food measurement procedures (e.g., weighing, measuring) were demonstrated and instructions for estimating food portion sizes were provided to participants. Participants were instructed to use the food and beverage calorie guide provided in the weight loss program manual, or internet dietary analysis program (e.g., www.calorieking.com; www.nutritiondata.com), to estimate energy intake from meals, snacks, and beverages. Participants received instruction on how to electronically submit daily records of
energy intake from breakfast, lunch, dinner, snacks, non-alcoholic beverages, alcoholic beverages, and total energy intake.

_Stigmatizing situations._ The Stigmatizing Situations Inventory (SSI; Myers & Rosen, 1999; Appendix B) was used to assess how often participants experience(d) overt acts of stigma/discrimination (i.e., stigmatizing situations) because of their weight. Participants completed the SSI at the onset of the intervention. This 50-item measure assesses the frequency of common stigmatizing experiences that are encountered by obese individuals. There are 11 subscales representing stigma categories (e.g., others making negative assumptions, nasty comments from children, physical barriers and obstacles, inappropriate comments from doctors, nasty comments from family). For each item, participants reported whether, and how often they have encountered that specific stigmatizing situation. Responses were recorded on a 10-point ordinal scale (0 = never, 5 = once a month, 9 = daily), with higher scores indicating more frequent encounters with stigmatizing situations. For the purposes of the current investigation, along with the total scale score, the SSI was divided into two subscales, the first measuring direct stigma from people in the environment (SSIP; e.g., inappropriate comments from doctors, nasty comments from children or family), and the second measuring other sources of stigma (SSIO; e.g., physical barriers and obstacles).

The Stigmatizing Situations Inventory has shown strong internal consistency (Chronbach’s $\alpha = 0.95$) in clinical samples of obese individuals seeking weight loss treatment (Myers & Rosen, 1999). Additionally, as expected, severely obese individuals reported significantly more stigmatizing encounters than less obese individuals (Myers & Rosen, 1999). Internal consistency for the SSI was strong in the current investigation ($\alpha = .92$). Similarly, internal consistencies for the SSIP and SSIO subscales were also high ($\alpha = .86$ and $\alpha = .88$,
respectively), and the intercorrelation between the SSIP and SSIO was significant ($r = .71, p < .01$).

**Depression.** The Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977; Appendix C) was used to assess participants’ current depressive symptoms. Participants completed the CES-D at the onset and completion of the intervention. The CES-D is a 20-item, self-report measure that assesses common symptoms of depression. Each item is a statement regarding a specific feeling or behavior, and participants are asked to report how often they have felt or behaved the way the item states. Responses were recorded on a 4-point ordinal scale (0 = rarely/less than one day, 1 = some of the time/1-2 days, 2 = occasionally/3-4 days, 3 = most or all of the time/5-7 days), with higher scores indicating increased depressive symptomatology.

The CES-D was developed using items from validated depression scales (e.g., Beck et al., 1961). Initial validation studies of the CES-D with large samples indicated strong internal consistency ($\alpha$ range = .84-.90; Radloff, 1977). Additionally, the test-retest reliabilities were moderate for retest periods ranging from two to eight weeks and ranged from .51-.67. Because this scale measures depressive symptomatology, it is likely that it is variable across time, and moderate test-retest reliabilities would be expected. Indicative of validity, the CES-D discriminated well between psychiatric inpatients and general population controls. The psychiatric inpatients score significantly higher than the population controls with 70% of inpatients scoring above the clinical cutoff, and only 21% of the general population scoring at or above this level (Radloff, 1977). The CES-D has been validated in numerous populations including older adults (Haringsma, Engels, Beekman & Spinhoven, 2004), across cultures (e.g., Cheung & Bagley, 1998), and with medical populations (e.g., Clark, Mahoney, Clark & Eriksen, 2002). For example, in a sample of adults diagnosed with chronic Hepatitis C, the internal
consistency was strong at all three assessment periods ($\alpha's = .88, .89$ and .90). Moreover, the CES-D also displayed predictive validity, indicating significant increases in depression following treatment for Hepatitis C, of which depressive symptoms are a common side effect. Internal consistency for the CES-D in the current investigation was strong ($\alpha = .86$).

**Binge eating.** The Binge Eating Scale (BES; Gormally, Black, Daston & Rardin, 1982; Appendix D) was used to assess participants’ binge eating behaviors. This 16-item scale provides a continuous measure of binge eating pathology. Eight items assess feelings and cognitions associated with binge eating (e.g., guilt, self-consciousness when eating) and eight behaviors associated with binge eating pathology (e.g., eating fast). Each item includes four statements that represent a range of severity for the characteristic ($0 = \text{no binge eating problem}$, $3 = \text{severe binge eating problems}$). For each item, participants chose the statement that best describes their perceptions about their eating behavior. Scores range from 0 to 46, with scores of 27 or above indicating of severe binge eating pathology, while a score of 17 or below is indicative of little to no binge eating (Marcus, Wing & Hopkins, 1988). Participants completed the BES at the onset and completion of the intervention.

Initially, the validity of the BES was tested on two samples of overweight females seeking weight loss treatment. The BES successfully discriminated between levels of binge eating severity as assessed by trained interviewers ($p < .001$). In a sample of 34 adult females, the BES had adequate test-retest reliability ($r = .87$) and was significantly associated with severity of binge episodes recorded in food records in a sample of 50 women ($r = .29-.40$, $p < .05$; Timmerman, 1999). Additionally, in an examination of 157 adults seeking treatment for binge eating, the BES was significantly correlated with the frequency of binge eating as assessed by the Eating Disorder Examination ($r = .24$, $p < .01$; Celio et al., 2004). Moreover, the BES and another
measure of binge eating (i.e., The Questionnaire on Eating and Weight Patterns; Spitzer et al., 1992) had substantial agreement (Cohen’s kappa = .64) for determining those with severe binge eating problems (Gladis et al, 1998). The BES is also sensitive to changes in binge eating behaviors. In an examination of 11 women being treated for binge eating, pre-treatment means on the BES were in the severe range (BES mean = 32.4, SD = 8.5) and post-treatment means were within the normal range (BES mean = 17.2, SD = 9.6). Internal consistency for the BES in the current investigation was strong (α = .84).

*Body image dissatisfaction.* The Multidimensional Body-Self Relations Questionnaire—Appearance Scales (MBSRQ-AS; shortened version of MBSRQ; Cash, Winstead & Janda, 1986; Appendix E) was used to assess participants’ satisfaction with their physical appearance. This 34-item measure includes five subscales: Appearance Evaluation (feelings of attractiveness or unattractiveness), Appearance Orientation (extent of investment in appearance), Overweight Preoccupation (fat anxiety, dieting and restraint), Self-Classified Weight (self-reported label of personal weight from very underweight to very overweight) and the Body Areas Satisfaction Scale (satisfaction with specific aspects of one’s appearance). However, only the Appearance Evaluation and the Appearance Orientation subscales were used in this investigation. Participants are asked to report how much they agree with each statement on a 5-point ordinal scale (1 = definitely disagree, 3 = neither agree nor disagree, 5 = definitely disagree). Participants completed the Appearance Evaluation and Appearance Orientation scales at the onset and completion of the intervention.

The MBSRQ-AS has strong internal consistency. In a normative sample of 1070 females and 996 males, internal consistencies for the five subscales ranged from .70 to .89 (Cash & Green, 1986; Cash, Winstead & Janda, 1986). Test-retest reliability of the MBSRQ-AS is also
adequate. Using college student samples, one-month test-retest reliabilities ranged from .74 to .91 (Cash & Green, 1986). In a sample of nearly 2000 adults, the factor-structure of the original 69-item MBSRQ was confirmed (Brown, Cash & Mikulka, 1990). Factor analyses revealed seven factors (Appearance Evaluation, Appearance Orientation, Fitness Evaluation, Fitness Orientation, Health Evaluation, Health Orientation, and Illness Orientation). Factor-item loadings were greater than .40 for females and .39 for males. Additionally, the factor structure accounted for 51% of the variance for females and nearly 54% of the variance for males. Internal consistency for the current investigation was adequate for the Appearance Orientation subscale (α = .72) and strong for the Appearance Orientation Subscale (α = .91).

**Negative affect.** The Negative Affect Scale (NAS) of the Positive and Negative Affect Scale (PANAS; Watson, Clark & Tellegen, 1988; Appendix F) was used to assess participants’ current levels of negative affectivity (i.e., state negative affectivity). High levels of negative affect have been associated with high levels of stress (Clark & Watson, 1986) poor self-esteem (Watson & Clark, 1984), and reported health concerns (Watson & Pennebaker, 1989). The NAS includes 10-items that describe different mood states. Participants were asked to report the extent to which they had experienced the mood state during the previous week on a 5-point Likert-type scale (1 = very slightly/not at all; 3 = moderately; 5 = very much). Participants completed the NAS at the onset and completion of the intervention.

Initial assessment of the PANAS indicated that internal consistency is high for the NAS (α = .87), and test-retest reliability was also adequate (.87 at 8 weeks; Watson, Clark & Tellegen, 1988) in a sample of college students. Crawford and Henry (2004) also found strong internal consistency for the NAS (α = .85) in a large British sample (n = 1003). Additionally, the NAS was significantly correlated with measures of depression, anxiety and stress, and accounted for a
significant portion of the variance in self-reported depression (p<.001) in this sample (Crawford & Henry, 2004). Internal consistency for the NAS was strong in the current investigation (α = .91).

Data Analysis

Baseline differences between participants receiving the LEARN weight loss program and the TYL weight loss program were assessed using t-tests, Chi-square tests and correlations for all demographic variables and baseline measures. Significant differences in baseline measures were controlled for in subsequent analyses.

Mediation analyses. Mediation analyses were conducted using the strategies outlined by MacKinnon (2008). Specifically, ordinary least squares regression and Pearson correlations were used to determine the direct effect of stigmatizing experiences on weight loss outcomes, the relationship between stigmatizing experiences and hypothesized mediators (i.e., depression, negative affectivity, binge eating, and body image dissatisfaction), and the relationship between the hypothesized mediators and weight loss outcomes controlling for stigmatizing experiences. The parameters found through regression analyses were used to calculate the indirect (mediated) effect of depression, negative affectivity, binge eating, and body image dissatisfaction. In other words, this calculation provided information regarding the direct effect of stigmatizing experiences on weight loss outcomes, and the degree to which this effect was accounted for by the influence of depression, negative affectivity, binge eating, and body image dissatisfaction on weight loss outcomes. Subsequently, significance tests were conducted and confidence intervals for the mediated effect were constructed to determine the significance and the accuracy of the mediated effect. Due to the small sample size, and directional hypotheses, one-tailed significance tests were utilized in all analyses.
Results

Forty-nine participants completed the 14-week intervention. There were no differences in income, education, race, age marital status, or weight between drop-outs and program completers. Baseline differences in demographic variables for TYL and LEARN participants were examined using Chi-Square analyses and t-tests. There were no group differences in income, education, race, marital status, age, or weight at baseline (See Table 2). Additionally, there were no group differences in baseline reports of stigma, binge eating, body image dissatisfaction, depression, or negative affectivity (See Table 2). Finally, no group differences were observed in percent weight loss during the intervention, t(46) = .991, p = .327, average caloric intake, expenditure, or calories expended through physical activity during the intervention. Thus, both groups were combined for all subsequent analyses.

Participants’ baseline BMI was significantly associated with reported stigmatizing experiences (r = .66, p < .001), stigma from people (r = .51, p < .001), and other sources of stigma (r = .72, p < .001). Greater stigma was associated with a higher initial BMI. Moreover, baseline BMI was significantly associated with baseline reports of negative affectivity (r = .24, p = .04) and Appearance Evaluation (r = -.42, p = .001). Greater negative affectivity and more negative evaluations of one’s body were associated with higher initial BMI.

Participants’ baseline BMI was not significantly associated with percent weight loss (r = -.20, p = .09). As expected, participants’ baseline BMI was significantly correlated with their average caloric expenditure (r = .44, p = .001), and average daily caloric intake (r = .30, p = .02). Interestingly, BMI was not significantly associated with average caloric expenditure through exercise (r = -.10, p = .25). Because there is a direct relationship between BMI and
caloric expenditure, BMI was controlled for in all analyses that included caloric expenditure. Although the relationship between BMI and caloric expenditure through exercise was not significant in this investigation, calories expended through exercise are proportional to one’s BMI, thus BMI was also controlled for in all analyses including caloric expenditure through exercise.

Changes from Pre- to Post-intervention

Participants’ weight decreased significantly from pre-intervention ($M = 228.48$, $SD = 46.73$) to post-intervention ($M = 215.20$, $SD = 47.20$), $t(48) = 9.07$, $p < .001$. Similarly, participants’ BMI decreased significantly from pre-intervention ($M = 36.64$, $SD = 6.67$) to post-intervention ($M = 34.51$, $SD = 6.82$), $t(48) = 9.07$, $p < .001$. Average percent weight loss from pre- to post-intervention was 6.0% ($SD = 4.41$; range: 17.0% - +2.0%). Additionally, self-reported depression and binge eating decreased significantly from pre- to post-intervention, $t(44) = 2.29$, $p = .03$; $t(41) = 6.58$, $p < .001$, respectively (See Table 4). Participants’ were initially classified in the “moderate binge eating” range defined by Gormally, Black, Dastin and Rardin (1982), but by the end of the intervention, the average binge eating score was in the subclinical range. Although participants depression scores decreased throughout the intervention, their scores on the CES-D were above the clinical cutoff score (i.e., CES-D < 16) for depressive symptoms at both pre- and post-intervention. Participants’ body image also changed significantly from pre- to post-intervention. Specifically, participants became more satisfied with their appearance, $t(44) = -7.24$, $p < .001$, and placed less importance on their looks $t(44) = 6.10$, $p < .001$. Overall negative affectivity also decreased from pre- to post-intervention, $t(42) = 1.98$, $p = .05$ (See Table 4).
Correlations between Psychological Distress Variables and Maladaptive Eating Patterns

Relationships between the proposed mediators were assessed using Pearson product-moment correlations. Baseline depression (i.e., CES-D) was significantly associated with baseline negative affectivity ($r = .58, p < .001$), but was not significantly associated with any other potential mediators (See Table 5). Baseline binge eating was significantly associated with Appearance Evaluation ($r = -.23, p = .05$), Appearance Orientation ($r = .37, p = .004$) and negative affectivity ($r = .34, p = .01$). Appearance Evaluation was significantly associated with Appearance Orientation ($r = -.23, p = .05$), and negative affectivity ($r = -.29, p = .02$). Finally, the relationship between Appearance Orientation and negative affectivity approached significance ($r = .21, p = .06$; See Table 5). With the exception of the association between baseline depression and negative affectivity, the associations among constructs were modest.

Hypothesized Mediation Analyses

In order to consider a variable a mediator, four assumptions/criteria must be met (Baron & Kenny, 1986; Judd & Kenny, 1981). These assumptions are 1) the independent variable must predict the mediator, 2) the independent variable must predict the dependent variable, 3) the potential mediator must predict the dependent variable even after the independent variable is controlled for, and 4) the effect of the independent variable on the dependent variable must decrease when the mediator is included as a predictor. Each of the four components is examined below.

Assumption 1: Relationships between stigmatizing experiences and psychological distress variables and maladaptive eating patterns. It was hypothesized that self-reported stigmatizing experiences would be significantly related to reports of depression, body image dissatisfaction and binge eating at the onset of the intervention. Pearson product-moment correlation analyses
revealed that stigmatizing experiences were significantly related to baseline depression ($r = .40$, $p = < .001$), binge eating ($r = .24, p = .04$), negative affectivity ($r = .31, p = .01$) and Appearance Evaluation ($r = -.36, p = .01$; See Table 6).

The relationships between stigmatizing experiences and the changes in the potential mediators from pre- to post-intervention were also examined. Stigmatizing experiences were significantly correlated with the change in Appearance Evaluation ($r = -.35, p = .005$). No other variables were significantly associated with reported stigmatizing experiences. One of the assumptions of mediation is that there must be a significant relationship between the independent variable and the hypothesized mediator. Thus, only baseline depression, binge eating, Appearance Evaluation, and negative affectivity, as well as the change in Appearance Evaluation from pre- to post-intervention were eligible for inclusion as potential mediators in the relationship between stigmatizing experiences and treatment outcomes.

The relationships between overt stigma from people (SSIP) and other types stigmatizing experiences (SSIO) with the potential mediators was also assessed using Pearson product-moment correlation analyses. SSIP was significantly associated with baseline depression scores ($r = .41, p = .001$), baseline negative affectivity ($r = .28, p = .02$), and change in binge eating from pre- to post-intervention. SSIO was significantly associated with baseline depression ($r = .33, p = .008$), baseline binge eating ($r = .29, p = .02$), baseline negative affectivity ($r = .30, p = .02$), baseline Appearance Evaluation ($r = -.45, p < .001$), and the change in Appearance Evaluation scores from pre- to post-intervention ($r = -.32, p = .02$; See Table 6).

**Assumption 2: Relationships between stigmatizing situations and treatment outcomes.**

The relationships between stigmatizing experiences and treatment outcomes were assessed using ordinary least squares regression. There was a trend towards significance for the relationship
between stigmatizing experiences and percentage of weight loss during the intervention, \( t(45) = -1.55, p = .06 \), such that the percentage of weight loss decreased as reported stigmatizing experiences increased. Stigmatizing experiences were significantly associated with total caloric intake, \( t(45) = 1.77, p = .04 \). Increased reports of stigmatizing experiences were associated with a larger daily caloric intake. The relationship between stigmatizing experiences and average caloric expenditure after controlling for the effects of BMI did not meet conventional levels of significance, \( t(44) = -1.42, p = .08 \). The relationship between stigmatizing experiences and calories expended through activity was significant after controlling for BMI, \( t(44) = -2.81, p < .004 \). Increased reports of stigmatizing experiences were associated with fewer calories burned through activity (See Table 7).

The relationships between SSIP and treatment outcomes were also assessed using least squares regression. SSIP was significantly associated with percentage of weight loss during the intervention such that increased SSIP was associated with poorer weight loss during the intervention, \( t(45) = -2.12, p = .02 \). SSIP was also significantly associated with average daily caloric intake, \( t(45) = 1.66, p = .05 \), and calories expended through exercise controlling for BMI, \( t(44) = -2.10, p = .02 \). Increased stigma was associated with increased caloric intake and decreased caloric expenditure through activity. SSIP was not associated with average caloric expenditure \( t(44) = -1.05, p = .15 \), thus, this relationship was not eligible for inclusion in the mediation analyses below (See Table 7).

The relationships between SSIO and treatment outcomes were also examined using least squares regression. SSIO was significantly associated with calories expended through exercise, \( t(44) = -3.02, p = .002 \), such that increased SSIO was associated with decreased caloric expenditure through exercise. The relationships between SSIO and increased average caloric
intake, \( t(45) = 1.58, p = .06 \), and decreased daily caloric expenditure, \( t(44) = -1.56, p = .06 \), did not meet conventional levels of significance. However, due to the small sample size, and limited power to detect significant relationships, these variables were retained for further analyses.

Finally, SSIO was not significantly associated with percent weight loss, \( t(45) = -.80, p = .43 \), so this relationship was not included in the mediation analyses below (See Table 7).

**Assumption 3: Relationships between potential mediators and treatment outcomes.** The direct relationships between the hypothesized mediators and the treatment outcomes were assessed to determine which potential mediators should be tested for the third assumption of mediation. Although not all potential mediators met the first assumption, they were included in these analyses to clarify the relationships between these variables and treatment outcomes.

The relationships between the potential mediating variables and percent weight loss were assessed using Pearson product-moment correlations. None of the baseline variables were significantly associated with percent weight loss. Only the change in reported binge eating was associated with percent weight loss \( (r = .42, p = .003) \). The relationships between baseline depression \( (r = -.19, p = .10) \), the change in reported depression \( (r = -.20, p = .09) \), and the change in AE \( (r = -.21, p = .09) \) and percent weight loss did not meet conventional levels of significance (See Table 8).

As noted above, only baseline depression, binge eating, negative affectivity, Appearance Evaluation, and the change in Appearance Evaluation from pre- to post-intervention were either significantly associated with, or had a trend towards a significant relationship with stigmatizing experiences. Out of these variables, only baseline depression, and the change in AE met the second assumption and were kept as potential mediators between stigmatizing experiences and percent weight loss. Similarly, baseline depression, negative affectivity, and change in binge
eating were significantly associated with SSIP. Out of these variables, only baseline depression met the second assumption and was kept as a potential mediator between SSIP and percent weight loss. Baseline depression, binge eating, negative affectivity, Appearance Evaluation, and the change in Appearance Evaluation from pre- to post-intervention were significantly associated with SSIO. Out of these variables, only baseline depression and the change in Appearance Evaluation met the second assumption and were kept as potential mediators between SSIO and percent weight loss.

The relationships between the potential mediating variables and average caloric intake, average caloric expenditure (controlling for BMI), and average caloric expenditure through exercise (controlling for BMI) were assessed using Pearson product-moment correlations. No potential mediating variable was significantly associated with average daily caloric intake, so caloric intake was not included as a dependent variable in subsequent mediation analyses. Baseline depression was significantly associated with average caloric expenditure \( (r = -.27, p = .05) \), and there was a trend towards significance for the relationship between average caloric expenditure and Appearance Orientation \( (r = -.26, p = .06) \). Average caloric expenditure through exercise was significantly associated with baseline depression \( (r = -.29, p = .04) \), binge eating \( (r = -.27, p = .05) \) and Appearance Orientation \( (r = -.30, r = .04; \) See Table 8).

The relationships between potential mediators and treatment outcomes after controlling for the independent variables (assumption 3) were not examined for potential mediators that were not directly associated with treatment outcomes. Thus, for caloric intake, no potential mediators remained. Baseline depression was kept as a potential mediator for the relationships between stigmatizing situations, SSIP, SSIO, and caloric expenditure. Similarly, baseline
depression was kept as a potential mediator for the relationships between stigmatizing situations, SSIP, SSIO, and caloric expenditure through exercise.

Assumptions 3 & 4: Effects of stigmatizing experiences and potential mediators on treatment outcomes.

Stigmatizing experiences. Least squares regression was conducted to determine if the relationship between stigmatizing experiences and treatment outcomes decreased when the potential mediators were included as predictors in the regression models. With percent weight loss as the dependent variable, stigmatizing experiences as the independent variable, and baseline depression as the potential mediator, the relationship between stigmatizing experiences and percent weight was diminished, however, the relationship between baseline depression and percent weight loss was not significant, indicating that mediation was not present (See Table 9). When the change in Appearance Evaluation replaced baseline depression in the above model, the relationship between stigmatizing experiences and percent weight loss was enhanced rather than diminished, and the relationship between change in Appearance Evaluation and percent weight loss was not significant (See Table 9), indicating that mediation was not present.

When baseline depression was included as a potential mediator between stigmatizing experiences and average caloric expenditure, the relationship between stigmatizing situations and average caloric expenditure was diminished, but the relationship between baseline depression and average caloric expenditure did not meet conventional levels of significance ($p = .08$). Because this relationship approached significance, and there was limited power in this investigation, baseline depression was kept as a potential mediator between stigmatizing experiences and average caloric expenditure. When baseline depression was included as a potential mediator between stigmatizing experiences and average caloric expenditure through
exercise, the relationship between stigmatizing experiences and average caloric expenditure through exercise was diminished, though still significant, and the relationship between baseline depression and average caloric expenditure through exercise was not significant, indicating that mediation was not present (See Table 9).

_Overt stigma from people._ Least squares regression was conducted to determine if the relationship between SSIP and treatment outcomes decreased when the potential mediators were included as predictors in the regression models. When baseline depression was included as a potential mediator between SSIP and percent weight loss, the relationship between SSIP and percent weight loss was diminished, although it remained significant, and the relationship between baseline depression and percent weight loss was not significant, indicating that mediation was not present (See Table 9). When baseline depression was included as a potential mediator between SSIP and average caloric expenditure through exercise, the relationship between SSIP and expenditure through exercise was diminished, and the relationship between baseline depression and average caloric expenditure through exercise approached significance ($p = .08$; See Table 9). Thus, baseline depression was kept as a potential mediator between SSIP and caloric expenditure through exercise.

_Other sources of overt stigma._ Least squares regression was conducted to determine if the relationship between SSIO and treatment outcomes decreased when the potential mediators were included as predictors in the regression models. When baseline depression was included as a potential mediator between SSIO and average caloric expenditure, the relationship between SSIO and average caloric expenditure was diminished, and the relationship between baseline depression and average caloric was not significant ($p = .06$; See Table 9). Finally, when baseline depression was included as a potential mediator between SSIO and average caloric expenditure
through exercise, the relationship between SSIO and average caloric expenditure through exercise was diminished, though remained significant, and the relationship between baseline depression and expenditure through exercise was significant \( (p = .05) \); See Table 9). Both models were formally tested for mediation below.

**Mediation Analyses**

Following the strategies outlined by MacKinnon (2008), the parameters from the least squares regression equations conducted for assumptions three and four, were compared to the parameters from the least squares regression equations used for assumptions one and two for the potential mediators that met all the above assumptions. Subsequently, the mediated effect (ME) was calculated by multiplying the parameters from the regression models for assumptions one and three \( (ME = a*b; \text{ where } a = \text{beta weight for independent variable predicting potential mediator, and } b = \text{beta weight for mediator predicting dependent variable after controlling for independent variable}) \). The ME was divided by the standard error of the ME (sME), providing a Z-score. This score was used to determine the significance of the ME \( (i.e., Z > 1.96 \text{ is significant at the .05 level}) \).

The first mediation model tested whether baseline depression significantly mediated the relationship between stigmatizing experiences and average caloric expenditure. Baseline depression did not significantly mediate this relationship \( (ME/sME = -1.32, p = ns; \text{ CI: [-2.24-0.44]}) \). The second mediation model tested whether baseline depression significantly mediated the relationship between stigma from people and average caloric expenditure through exercise. Baseline depression did not significantly mediate this relationship \( (ME/sME = 1.31, p = ns; \text{ CI: [-63.39-12.68]}) \). The third mediation model tested whether baseline depression mediated the relationship between stigma from others and average caloric expenditure. Baseline depression
did not significantly mediate this relationship (ME/sME = -1.33, \( p = ns \); CI: [-83.81-16.02]). The final mediation model tested whether baseline depression significantly mediated the relationship between stigma from others and average caloric expenditure through exercise. Baseline depression did not significantly mediate this relationship (ME/sME = 1.37, \( p = ns \); CI: [-48.06-12.68]). Thus, analyses did not support the hypothesized mediation.

Post Hoc Analyses

When testing for mediation, it was apparent that rather than diminishing the relationship between the stigmatizing experiences and treatment outcomes, the presence of the change in Appearance Evaluation as a potential mediating variable actually improved the relationship between stigmatizing experiences and treatment outcomes. Post Hoc analyses were conducted to determine if this variable were in fact suppressor variable (i.e., variable that increases the predictive validity of another variable when included in the regression equation [Conger, 1974]) as opposed to a mediating variable. Although the change in Appearance Evaluation enhanced the relationship between stigmatizing experiences and percent weight loss, the indirect effect (i.e., suppression effect) was not significant (indirect effect = -.59; [CI: -.0002-.0001]; See Note 3).

Discussion

Individuals who are overweight or obese are regular targets of negative stereotypes, discrimination and bias (e.g., Carr & Friedman, 2005; Fabricatore & Wadden, 2004; Puhl & Brownell, 2001). The current study sought to examine the nature of the relationship between weight-related stigmatizing experiences and weight loss treatment outcomes. Additionally, the current study sought to examine whether psychosocial factors commonly associated with poor weight loss outcomes and, to a lesser extent, weight stigma (i.e., self-reported depression, body
image dissatisfaction, and binge eating) mediated the relationship between weight-related stigma and weight loss treatment outcomes.

Outcomes of the Intervention

During treatment participants lost an average of 13.28 lbs or 6% of their baseline weight. Additionally, participants’ self-reported depression, binge eating, investment in their appearance and negative affectivity significantly decreased from pre- to post-intervention. Participants also became significantly more satisfied with their appearance following the intervention. Importantly, while participants were classified as “moderate binge eaters” at the onset of the intervention (Gormally, Black, Dastin & Rardin, 1982), average binge eating scores were in the “subclinical” range by the end of treatment. Although self-reported depressive symptoms decreased throughout the intervention, it is important to note that participants continued to report high levels of depressive symptoms at post-intervention. In fact, the average scores on the depression measure were in the clinical range at both pre- and post-intervention. Although this is somewhat surprising, it is not unexpected given the high rates of depression often seen among obese, treatment seeking populations (Goldsmith et al., 1992; Werij, Mulkens, Hospers & Jansen, 2005). Nevertheless, overall, the BWLP was associated with improvements in weight, maladaptive eating patterns, body image dissatisfaction, and psychological distress.

Consistent with previous research, higher baseline BMI was associated with poorer body image, increased negative affectivity, and increased reports of weight-related stigmatizing experiences (Cash, Winstead & Janda, 1986; Friedman et al., 2001; Goldsmith et al., 1992). For example, Falkner and colleagues (1999) found that BMI was significantly associated with weight-related mistreatment ($r = .39, p < .01$). Interestingly, there was a trend for larger participants to lose a smaller percentage of weight than those with a lower initial BMI in the
current investigation, although this relationship did not meet conventional levels of significance ($p = .09$). As described in detail below, weight-based stigmatizing experiences negatively impacted weight loss outcomes in the current investigation. The greater weight-based stigma experienced by heavier participants may partially explain why heavier participants lost a lesser percentage of weight than the lighter participants.

Relationships among Psychological Distress Variables and Maladaptive Eating Patterns

This investigation confirms previous findings between psychological distress and maladaptive eating patterns (e.g., Attie & Brooks-Gunn, 1989; Eldredge & Agras, 1996; Kuehnel & Wadden, 1994). For example, increased reports of baseline binge eating were significantly associated with increased negative affectivity, increased investment in one’s appearance (i.e., Appearance Orientation), and decreased feelings of attractiveness and satisfaction with one’s body (i.e., Appearance Evaluation). Past research supports the link between binge eating and body image dissatisfaction (e.g., Eldredge & Agras, 1996; Wilfley, Schwartz, Spurrell & Fairburn, 2000) and negative affectivity and image dissatisfaction (e.g., Presnell, Bearman & Stice, 2004). In the current investigation, decreased feelings of attractiveness were significantly associated with increased negative affectivity and increased investment in one’s appearance. Similarly, increased investment in one’s appearance was significantly associated with increased negative affectivity. Additionally, in a sample of 107 obese women, Telch and Agras (1994) discovered a significant association between binge eating and psychological distress. While in the expected direction, the relationship between depressive symptoms and increased binge eating in the current investigation did not reach conventional levels of statistical significance ($p = .09$). Although the current study cannot determine causal pathways among psychological distress and maladaptive eating patterns, the findings emphasize the numerous struggles that overweight and
Obese people face. As described in detail below, psychological distress and binge eating behaviors negatively impacted participants’ ability to make the changes necessary for successful weight loss. The relationships among binge eating, negative affectivity and poor body image are especially concerning given that binge eating behaviors are in direct opposition to behavioral recommendations for weight loss (i.e., decreased caloric intake). Thus, in order to optimize treatment success, behavioral weight loss programs need to address participants’ psychosocial difficulties in addition to promoting behavioral change.

**Relationships among Potential Mediators and Weight Loss Treatment Outcomes**

Although past research clearly indicates that self-reported depression, binge eating and body image are detrimental to weight loss success in a BWLP (e.g., Agras et al., 1997; Linde et al., 2004; Taverso et al., 2000), this was not observed in the current investigation. Baseline reports of negative affectivity, binge eating and body image dissatisfaction were not associated with weight loss during the intervention, and while there was a trend for baseline depressive symptoms to negatively impact weight loss, this relationship did not meet conventional levels of significance. Similarly, these variables were unrelated to caloric intake and overall caloric expenditure. The current study’s small sample and lack of statistical power may account for these conflicting findings. In fact, the effect sizes were small in the current investigation ($r$ range = .01-.42). Power analyses indicate that a sample size of 85 participants would have been needed to correctly detect statistical significance for the observed effect sizes 80% of the time. Alternatively, because successful weight loss is the outcome of numerous different behaviors (e.g., increased exercise, altering one’s diet, planning ahead for meals, etc.), psychosocial variables may impact one or multiple specific behaviors that result in successful weight loss such
as participation in exercise, but in the end have a non-observable impact on weight loss during a short BWLP.

In fact, higher levels of physical activity were significantly associated with lower levels of depression, binge eating and higher levels of investment in one’s appearance. Although the direction of causality cannot be determined in the current investigation, past research suggests that increased exercise is associated with reduced binge eating and depression. In fact, exercise has been included in multi-component treatments of depression and binge eating disorder (Levine, Marcus & Moulton, 1996). Conversely, past research does not support the relationship between investment in one’s appearance and exercise behaviors. For example, body image was not associated with exercise participation in a sample of 200 men and women (Davis & Cowles, 1991). However, Davis and Cowles’ study assessed physically active men and women, the majority of whom had BMI’s in the normal to overweight range. Current participants were overweight or obese and described their lifestyles as sedentary at the onset of the intervention, so it is plausible that the differences in sample characteristics accounts for the conflicting findings. Additionally, Davis and Cowles (1991) did not directly assess the importance one places on his or her appearance (i.e., appearance orientation), as a component of their body image assessment, which also may account for the conflicting findings. Nevertheless, participants who placed more importance on their appearance participated in more physical activity than participants who were less invested in their appearance. Interestingly, participant’s satisfaction with their appearance was not associated with physical activity participation. It appears that physical activity is unique as compared to the other weight loss treatment outcomes and may be more amenable to influence from psychological distress and maladaptive eating patterns, and reciprocally, exercise may exert a positive influence on these variables. Increased physical activity is regularly promoted
throughout many BWLPs, and the effects of exercise promotion may be enhanced if treatment also focuses on reducing psychological distress and binge eating behaviors. However, it will be important for future research to assess the relationship between body image and physical activity in a weight loss treatment seeking population in order to clarify the conflicting findings.

*Relationships among Potential Mediators and Stigmatizing Experiences*

Previous research indicates that stigmatizing experiences are significantly related to psychological distress and maladaptive eating patterns (e.g., Jackson, Grilo & Masheb, 2000; Fairburn et al., 1998; Myers & Rosen, 1999). For instance, in a sample of 93 obese adults self-selected into a behavioral weight loss program, stigmatizing experiences were significantly associated with higher levels of depression, binge eating, and global psychological distress (Ashmore, Friedman, Reichmann & Musante, 2008). Moreover, weight stigma in the form of teasing has been empirically linked to body image dissatisfaction (Matz, Foster, Faith & Wadden, 2002). It was hypothesized that stigmatizing experiences would be significantly associated with depression, negative affectivity, binge eating, and body image dissatisfaction. These hypotheses were supported in the current investigation.

Because depression, binge eating, negative affectivity and body image dissatisfaction were assessed prior to and following the 14-week intervention, it was also possible to examine the relationships between weight-related stigma and the change in these variables in response to treatment. While binge eating behaviors significantly decreased throughout the intervention, participants reporting more baseline interpersonal weight-related stigma (SSIP) evidenced smaller declines in binge eating in response to treatment. Similarly, while participants became more satisfied with their appearance following treatment, participants reporting more baseline weight-related stigma evidenced lesser improvements in body image.
Relationships among Stigmatizing Experiences and Weight Loss Treatment Outcomes

Participants in the current investigation did not report encountering a large amount of stigmatizing experiences. On average, participants reported encountering each of the 50 stigmatizing events about once in their life ($M = 0.90; SD = 0.65$). The rates of stigmatizing experiences in this investigation were lower than the rates of weight-related stigma seen in other investigations (i.e., Myers and Rosen, 1999; $M = 1.90$; frequency = several times in their life). However, the current investigation included participants with a BMI of 27 and above, while Myers and Rosen’s (1999) only examined obese individuals. Given that research suggests that weight related stigma increases with increasing weight (e.g., Falkner et al., 1999; Friedman et al., 2005), it is not surprising that the frequency of reported stigmatizing experiences would be lower in an investigation which included both overweight and obese participants rather than only obese participants. Consistent with past findings, baseline BMI in the current investigation was significantly associated with increased reports of weight-related stigma.

Although reported stigmatizing experiences were modest, significant associations between stigma and treatment outcomes were observed. While the association between increased weight-related stigma and poorer weight loss during the BWLP did not reach conventional levels of statistical significance ($p = .06$), weight-related stigma from people significantly predicted poorer weight loss in this investigation ($p = .02$). The relationship between weight stigma from other sources and weight loss was not significant. Thus, it appears that specific types of weight-related stigma, such as teasing and hurtful comments from others were more detrimental to participants’ ability to lose weight in the BWLP. It may be that negative comments are a form of stigma that is more easily internalized than other types of stigma such as environmental barriers. Although popular culture suggests that negative statements toward overweight and obese
individuals provides motivation for weight loss, the current findings challenge this notion, and indicate that stigma from people actually hinders successful weight loss, and is harmful to the psychological well-being of the individual. It will be important for future research to continue to examine the detrimental effects of specific types of stigma on weight loss outcomes.

Previous research suggests that weight stigma is associated with coping through increased caloric intake (Puhl & Brownell, 2006), and a higher motivation to avoid exercise (Vartanian & Shaprow, 2008). In the current investigation, stigmatizing experiences, stigma from people and other sources of stigma predicted average daily caloric intake and average caloric expenditure through exercise during the program (the relationship between other sources of stigma and caloric intake did not reach conventional levels of significance, $p = .06$). The more frequent weight related stigma experienced by participants, the higher their caloric intake, and the fewer calories they expended through physical activity. These results are consistent with, and add to the findings from Carels and colleagues (in press), which indicated that internalized weight bias was associated with weight loss treatment outcomes such as increased caloric intake and decreased caloric expenditure.

Taken together, it appears that overt and internalized weight-stigma are detrimental to an individual’s ability to engage in the behaviors necessary for successful weight loss. It was hypothesized that psychological distress and maladaptive eating patterns were the mechanisms through which overt weight-based stigma would result in poorer weight loss treatment outcomes. This hypothesis was not supported (described below). However, it is plausible that another psychosocial variable not assessed in this investigation, such as self-efficacy or learned helplessness, may provide insight into the nature of relationship among weight-based stigma and weight loss treatment outcomes. Overweight and obese individuals are bombarded with
messages stating that they are lazy, out of control, lack will-power, and are unacceptable as they are, and they internalize these messages (e.g., Wang, Brownell & Wadden, 2004). Successful weight loss is difficult and requires individuals to make, and sustain, a myriad of behavioral changes. It is plausible that stigma from external and internal sources may decrease individuals’ self-efficacy for weight loss behaviors, and make behavior change more difficult. Alternatively, stigma in conjunction with unsuccessful weight loss attempts may facilitate learned helplessness which may be detrimental to behavior change. The relationships between weight-based stigma and self-efficacy and learned helplessness were not found in a review of the weight stigma literature. Future research should assess the mechanism through which weight-based stigma impedes weight loss in a BWLP.

As noted above, a direct relationship was observed between weight-related stigma and calories expended through physical activity in the current investigation. While Vartanian and Shaprow (2008) did not observe a direct relationship between weight-related stigma and exercise behaviors, they did observe that increased overt weight stigma was associated with fewer intentions to exercise. Finally, increased stigmatizing experiences, and stigma from other sources were also associated with lower average caloric expenditure, although these relationships did not meet conventional levels of significance. The effect sizes for these relationships were small ($r$'s = .26 and .23 respectively). As mentioned above, the current investigation did not have adequate power to accurately detect the statistical significance of these effects 80% of the time, so it is plausible that these relationships were attenuated due to the small variability in the frequency of encountering weight-related stigma and the relatively small sample size.

*Hypothesized Mediation*
A goal of the current investigation was to assess whether depression, binge eating, and body image dissatisfaction mediated the relationship between stigmatizing experiences and weight loss treatment outcomes. This investigation found no evidence that depression, binge eating or body image mediated the relationships between weight-related stigma and weight loss treatment outcomes. As noted above participants reported modest amounts of weight-related stigma. The modest levels of weight-related stigma may have decreased the ability for psychological distress variables and maladaptive eating patterns to mediate the relationship between weight-related stigma and weight loss treatment outcomes. The relationships between weight-based stigma and the potential mediators may be evident among individuals experiencing greater levels of weight-based stigma. Clearly, even at modest levels, weight-based stigma is detrimental to the psychological and physical well-being of overweight and obese individuals. It is quite plausible that the harmful effects may be enhanced as stigmatizing encounters increase. The current investigation was not able to examine this possibility due to the modest reports of weight-based stigma. Moreover, the small sample size decreased the ability to detect significant relationships. It will be important for future research to assess whether psychological distress variables and maladaptive eating patterns mediate the relationship between weight stigma and weight loss treatment outcomes in a large sample that reports a higher degree of weight stigma.

 Limitations

While this investigation provides insight into the nature of the relationships between weight-related stigma and weight loss treatment outcomes, important limitations need to be addressed. To begin, the current sample was small and homogeneous. Statistical procedures used to assess mediation often require a large sample size, and although the current investigation utilized a powerful method of computing mediation (i.e., MacKinnon, 2008), the findings may
have been attenuated by the limited sample size, resulting in diminished power to detect significant differences. Additionally, the majority of the sample was female and Caucasian. This significantly limits the generalizability of the results. Also, the sample consisted of overweight and obese individuals seeking weight loss treatment. The results of the current investigation likely would not be generalizable to an overweight/obese population not seeking weight loss treatment. Previous research suggests that these populations differ in important characteristics, many of which were included in this study (e.g., depressive symptoms, binge eating; Goldsmith et al., 1992; Grissett & Fitzgibbon, 1996). Thus, it will be important for future studies to examine the relationships between weight-based stigma, psychological distress and maladaptive eating patterns with weight loss outcomes in diverse samples.

The current sample reported encountering fewer stigmatizing experiences than reported in previous research assessing obese individuals. As mentioned above, the current investigation included adults with a BMI greater than 27, which may account for this difference. It is plausible that the limited reports of stigmatizing encounters may have prevented the detection of potential mediating variables. Nevertheless, reports of stigmatizing experiences significantly predicted weight loss treatment outcomes. Because the current investigation’s small sample size and the relatively low frequency of stigmatizing experiences reported by participants limited the ability to detect potential relationships, the significant relationships that were observed appear to be robust, and it appears that even limited stigmatizing encounters exert a strong detrimental impact on overweight and obese individuals’ success in BWLPs.

It is also important to note that the current participants reported high levels of depressive symptomatology. Although high rates of self-reported depressive symptoms are common in overweight and obese individuals seeking treatment (Goldsmith et al., 1992; Werrij, Mulkens,
Stigma and Weight Loss Outcomes

Hospers & Janson, 2005), the high rates of depressive symptoms may have negatively impacted participants’ ability to follow through with program recommendations. Thus, current findings should be interpreted with caution.

Implications

Weight-related stigma continues to be pervasive in American society, and this investigation indicates that overt weight stigma has detrimental effects on overweight and obese individuals’ ability to lose weight and engage in behaviors consistent with weight loss (i.e., limiting caloric intake, engaging in physical activity). Additionally, this investigation indicated that weight-related stigma is directly associated with psychological distress, maladaptive eating patterns and body image dissatisfaction. This investigation also attests to the powerful impact of weight-related stigma. Although this study included a small sample size, and participants only reported encountering each of the included stigmatizing experiences about once in their life, the significant detrimental impact of these experiences on psychological well being and weight loss treatment outcomes was observed.

Although psychological distress and maladaptive eating patterns did not directly influence weight loss in this investigation, and also failed to mediate the relationships between overt weight-based stigma and weight loss treatment outcomes, they remain important variables to consider in weight loss research. The current sample reported baseline levels of depression and binge eating that were, on average, in the clinical range. This is concerning because although these variables did not predict weight loss, they were predictive of behaviors that are important for weight loss and healthy living, such as participation in physical activity. It will be important
for future BWLPs to include components that directly address psychological distress symptoms and maladaptive eating patterns in the program curriculum.

Clearly, large scale interventions are needed to reduce levels of weight bias in the general population with the hope that overt stigma toward overweight and obese individuals would be reduced. Until that is accomplished, weight loss interventions should incorporate discussions on weight-related stigma and help participants to cope with their personal history of encountering weight-related stigma in order to promote enhanced weight loss and behaviors consistent with a healthy lifestyle.
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Appendix A

Demographic Questionnaire

1. What is your age? ______

2. What is your marital status?
   a. Single
   b. Married/Living with partner
   c. Divorced/Separated
   d. Widowed

3. What is the highest level of education you have completed?
   a. Less than high school
   b. Graduated high school/GED
   c. Some College
   d. Graduated college
   e. Master’s Degree
   f. Doctorate or other professional degree

4. What is your household’s annual income?
   a. < $30,000
   b. $30,000-$45,000
   c. $45,000-$60,000
   d. $60,000-$75,000
   e. > $75,000

5. How do you describe yourself?
   a. Caucasian
   b. African American
   c. Asian/Pacific Islander
   d. Hispanic/Latino(a)
   e. Native American
   f. Other
Appendix B

Stigmatizing Situations Inventory (Myers & Rosen, 1999).

Below is a list of situations that people encounter because of their weight. Indicate whether, and how often, each of these situations happens to you. In the spaces below, write the number which best describes how often you encounter each situation. Use the scale below:

0-----------1--------------2-------------3------------4-------------5-------------6------------7------------8------------9
Never   Once in   Several times   About      Several    About once    Several      About      Several     Daily
your life    in your life     once/yr.  times/yr.     a month     times/mo.  once/wk.  times/wk.

1. A child coming up to you and saying something like, "You're fat!"
2. A doctor blaming unrelated physical problems on your weight.
3. A parent or other relative nagging you to lose weight.
4. A spouse/partner calling you names because of your weight.
5. A spouse/partner telling you to lose weight in order to be more attractive.
6. As an adult, having a child make fun of you.
7. Being called names, laughed at, or teased by other children when you were young.
8. Being glared at or harassed by bus passengers for taking up "too much" room.
9. Being hit, beaten up or physically attacked because of your weight.
10. Being offered fashion advice from strangers.
11. Being passed up for a promotion, given bad assignments, or otherwise discriminated against at work.
12. Being sexually harassed (cat-calls, wolf-whistles, etc.) because of your weight.
13. Being singled out as a child by a teacher, school nurse, etc. because of your size.
15. Being the only heavy person, or the heaviest person, at a family gathering.
16. A doctor saying that your weight is a health problem, even when you are in good health.
17. Being told, "All you really need is a little willpower."
18. Being unable to get a date because of your size.
19. Children loudly making comments about your weight to others.
20. Friends, acquaintances, co-workers, etc. making fun of your appearance.
21. Groups of people pointing and laughing at you in public.
22. Having a doctor make cruel remarks, ridicule you, or call you names.
23. Having a doctor recommend a diet even if you did not come in to discuss weight loss.
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0---------1---------2---------3---------4---------5---------6---------7---------8---------9
Never Once in Several times About Several About once Several About Daily
your life. in your life once/yr. times/yr. a month times/mo. once/wk. times/wk.

___ 24. Having a romantic partner exploit you, because s/he assumed you were "desperate" and would put up with it.
___ 25. Having a spouse or partner be ashamed to admit to being with you.
___ 26. Having family members feel embarrassed by you or ashamed of you.
___ 27. Having friends not notice weight loss, or not encourage your efforts to lose weight.
___ 28. Having people assume that you overeat or binge-eat because you are overweight.
___ 29. Having people assume you have emotional problems because you are overweight.
___ 30. Having strangers suggest diets to you.
___ 31. Having strangers take photographs of you, as if you were an exhibit.
___ 32. Having your children tease or insult you because of your weight.
___ 33. In the supermarket, having people criticize or make comments about your food choices.
___ 34. Losing a job because of your size.
___ 35. Not being able to find clothes that fit.
___ 36. Not being able to find medical equipment in a size that works for you.
___ 37. Not being able to find sports equipment in a size that fits you.
___ 38. Not being able to fit into bus or airplane seats, into small cars, or into standard seatbelts.
___ 39. Not being able to fit into seats at restaurants, theaters, and other public places.
___ 40. Not being able to fit through turnstiles, on amusement park rides, or other places not already mentioned.
___ 41. Not being hired because of your weight, shape, or size.
___ 42. Other people having low expectations of you because of your weight.
___ 43. Overhearing other people making rude remarks about you in public.
___ 44. Parents or other relatives telling you how attractive you would be, if you lost weight.
___ 45. People telling you that you will never find a partner if you don't lose weight.
___ 46. Seeing bumper stickers, t-shirts, advertising, etc. that ridicules fat people.
___ 47. Strangers asking intrusive, personal questions about your weight.
___ 48. Strangers making abusive remarks to you (e.g. saying you are disgusting, or that you don't deserve to live).
___ 49. When eating in public, being told “You really shouldn't be eating that.”
___ 50. When walking outside, having people drive by and laugh or shout insults.
Center for Epidemiological Studies Depression Scale (Radloff, 1977).

Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the past week.

**During the Past Week**

<table>
<thead>
<tr>
<th></th>
<th>Rarely or none of the time (less than 1 day)</th>
<th>Some or a little of the time (1-2 days)</th>
<th>Occasionally or a moderate amount of time (3-4 days)</th>
<th>Most or all of the time (5-7 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I was bothered by things that usually don’t bother me.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>I did not feel like eating; my appetite was poor.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>I felt that I could not shake off the blues even with help from my family or friends.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>I felt I was just as good as other people.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>I had trouble keeping my mind on what I was doing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>I felt depressed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>I felt that everything I did was an effort.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>8.</td>
<td>I felt hopeful about the future.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>I thought my life had been a failure.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>I felt fearful.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>My sleep was restless.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>I was happy.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>I talked less than usual.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rarely or none of the time (less than 1 day)</td>
<td>Some or a little of the time (1-2 days)</td>
<td>Occasionally or a moderate amount of time (3-4 days)</td>
<td>Most or all of the time (5-7 days)</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------</td>
<td>----------------------------------------</td>
<td>----------------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>15. People were unfriendly.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. I enjoyed life.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. I had crying spells.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. I felt sad.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>19. I felt that people dislike me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. I could not get “going.”</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix D

Binge Eating Scale (Gormally, Black, Daston & Rardin, 1982).

*Below are groups of numbered statements. Read all of the statements in each group and mark on this sheet the one that best describes the way you feel about the problems you have controlling your eating behavior.*

1. _____ I don’t feel self-conscious about my weight or body size when I’m with others.  
   _____ I feel concerned about how I look to others, but it normally does not make me feel disappointed with myself.  
   _____ I do get self-conscious about my appearance and weight which makes me feel disappointed in myself.  
   _____ I feel very self-conscious about my weight and frequently, I feel intense shame and disgust for myself. I try to avoid social contacts because of my self-consciousness.

2. _____ I don’t have any difficulty eating slowly in the proper manner.  
   _____ Although I seem to “gobble down” foods, I don’t end up feeling stuffed because of eating too much.  
   _____ At times, I tend to eat quickly and then, I feel uncomfortably full afterwards.  
   _____ I have the habit of bolting down my food, without really chewing it. When this happens I usually feel uncomfortably stuffed because I’ve eaten too much.

3. _____ I feel capable to control my eating urges when I want to.  
   _____ I feel like I have failed to control my eating more than the average person.  
   _____ I feel utterly helpless when it comes to feeling in control of my eating urges.  
   _____ Because I feel so helpless about controlling my eating I have become very desperate about trying to get in control.

4. _____ I don’t have the habit of eating when I’m bored.  
   _____ I sometimes eat when I’m bored, but often I’m able to “get busy” and get my mind off food.  
   _____ I have a regular habit of eating when I’m bored, but occasionally, I can use some other activity to get my mind off eating.  
   _____ I have a strong habit of eating when I’m bored. Nothing seems to help me break the habit.

5. _____ I’m usually physically hungry when I eat something.  
   _____ Occasionally, I eat something on impulse even thought I really am not hungry.  
   _____ I have the regular habit of eating foods, that I might not really enjoy, to satisfy a hungry feeling even though physically, I don’t need the food.  
   _____ Even though I am not physically hungry, I get a hungry feeling in my mouth that only seems to be satisfied when I eat a food, like a sandwich, that fills my mouth. Sometimes, when I eat the food to satisfy my mouth hunger, I then spit out the food so I won’t gain weight.

6. _____ I don’t feel any guilt or self-hate after I overeat.  
   _____ After I overeat, occasionally I feel guilt or self-hate.  
   _____ Almost all the time I experience strong guilt or self-hate after I overeat.
7. _____ I don’t lose total control of my eating when dieting even after periods when I overeat.
   _____ Sometimes when I eat a “forbidden food” on a diet, I feel like I “blew it” and eat even more.
   _____ Frequently, I have the habit of saying to myself, “I’ve blown it now, why not go all the way?” when on a diet. When that happens I eat even more.
   _____ I have a regular habit of starting strict diets for myself, but I break the diets by going on an eating binge. My life seems to be either a “feast” or “famine.”

8. _____ I rarely eat so much food that I feel uncomfortably stuffed afterwards.
   _____ Usually about once a month, I eat such a quantity of food, I end up feeling very stuffed.
   _____ I have regular periods during the month when I eat large amounts of food, either at mealtime or at snacks.
   _____ I eat so much food that I regularly feel quite uncomfortable after eating and sometimes a bit nauseous.

9. _____ My level of calorie intake does not go up very high or go down very low on a regular basis.
   _____ Sometimes after I overeat, I will try to reduce my caloric intake to almost nothing to compensate for the excess calories I’ve eating.
   _____ I have a regular habit of overeating during the night. It seems that my routine is not to be hungry in the morning but overeat in the evening.
   _____ In my adult years, I have had week-long periods where I practically starve myself. This follows periods when I overeat. It seems I live life of either “feast or famine.”

10. _____ I usually am able to stop eating when I want to. I know when “enough is enough.”
    _____ Every so often, I experience a compulsion to eat which I can’t seem to control.
    _____ Frequently, I experience strong urges to eat which I seem unable to control, but at other times I can control my eating urges.
    _____ I feel incapable of controlling urges to eat. I have a fear of not being able to stop eating voluntarily.

11. _____ I don’t have any problem stopping eating when I feel full.
    _____ I usually can stop eating when I feel full but occasionally overeat leaving me feeling uncomfortably stuffed.
    _____ I have a problem stopping eating once I start and usually I feel uncomfortably stuffed after I eat a meal.
    _____ Because I have a problem not being able to stop eating when I want, I sometimes have to induce vomiting to relieve my stuffed feeling.

12. _____ I seem to eat just as much when I’m with others (family, social gatherings) as when I’m by myself.
    _____ Sometimes, when I’m with other persons, I don’t eat as much as I want to eat because I’m self conscious about my eating.
    _____ Frequently, I eat only a small amount of food when others are present, because I’m very embarrassed about my eating.
I feel so ashamed about overeating that I pick times to overeat when I know no one will see me. I feel like a “closet eater.”

I eat three meals a day with only an occasional between meal snack.
I eat three meals a day, but I also normally snack between meals.
When I am snacking heavily, I get in the habit of skipping regular meals.
There are regular periods when I seem to be continually eating, with no planned meals.

I don’t think much about trying to control unwanted eating urges.
At least some of the time, I feel my thought are pre-occupied with trying to control my eating urges.
I feel that frequently I spend much time thinking about how much I ate or about trying not to eat anymore.
It seems to me that most of my waking hours are pre-occupied by thoughts about eating or not eating. I feel like I’m constantly struggling not to eat.

I don’t think about food a great deal.
I have strong cravings for food but they last only for brief periods of time.
I have days when I can’t seem to think about anything else but food.
Most of my days seem to be pre-occupied with thoughts about. I feel like I live to eat.

I usually know whether or not I’m physically hungry. I take the right portion of food to satisfy me.
Occasionally, I feel uncertain about knowing whether or not I’m physically hungry.
At these times it’s hard to know how much food I should take to satisfy me.
Even though I might know how many calories I should eat, I don’t have any idea what is a “normal” amount of food for me.
Appendix E

The Multidimensional Body-Self Relations Questionnaire – Appearance Scales
(Cash, Winstead & Janda, 1986)

INSTRUCTIONS--PLEASE READ CAREFULLY

The following pages contain a series of statements about how people might think, feel, or behave. You are asked to indicate the extent to which each statement pertains to you personally. Your answers to the items in the questionnaire are anonymous, so please do not write your name on any of the materials. In order to complete the questionnaire, read each statement carefully and decide how much it pertains to you personally. Using a scale like the one below, indicate your answer by entering it to the left of the number of the statement.

There are no right or wrong answers. Just give the answer that is most accurate for you. Remember, your responses are confidential, so please be completely honest and answer all items.

EXAMPLE:

_____ I am usually in a good mood.
In the blank space, enter a 1 if you definitely disagree with the statement;
enter a 2 if you mostly disagree;
enter a 3 if you neither agree nor disagree;
enter a 4 if you mostly agree;
or enter a 5 if you definitely agree with the statement.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Definitely Disagree</td>
<td>Mostly Disagree</td>
<td>Neither Agree Nor Disagree</td>
<td>Mostly Agree</td>
<td>Definitely Agree</td>
</tr>
</tbody>
</table>

_____ 2. I am careful to buy clothes that will make me look my best.
_____ 3. My body is sexually appealing.
_____ 4. I constantly worry about being or becoming fat.
_____ 5. I like my looks just the way they are.
_____ 6. I check my appearance in a mirror whenever I can.
_____ 7. Before going out, I usually spend a lot of time getting ready.
_____ 8. I am very conscious of even small changes in my weight.
_____ 9. Most people would consider me good-looking.
_____ 10. It is important that I always look good.
_____ 11. I use very few grooming products.
_____ 12. I like the way I look without my clothes on.
_____ 13. I am self-conscious if my grooming isn't right.
_____ 14. I usually wear whatever is handy without caring how it looks.
_____ 15. I like the way my clothes fit me.
16. I don't care what people think about my appearance.
17. I take special care with my hair grooming.
18. I dislike my physique.
19. I am physically unattractive.
20. I never think about my appearance.
21. I am always trying to improve my physical appearance.
22. I am on a weight-loss diet.
Appendix F

Negative Affect Subscale of the Positive and Negative Affect Scales

Directions
This scale consists of a number of words that describe different feelings and emotions. Read each item and then circle the appropriate answer next to that word. Indicate to what extent you have felt this way during the past week.

Use the following scale to record your answers.

\((1) = \text{Very slightly or not at all} \quad (2) = \text{A little} \quad (3) = \text{Moderately} \quad (4) = \text{Quite a bit} \quad (5) = \text{Extremely}\)

<table>
<thead>
<tr>
<th></th>
<th>Very slightly or not at all</th>
<th>A little</th>
<th>Moderately</th>
<th>Quite a bit</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Distressed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. Upset</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. Guilty</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. Scared</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. Hostile</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. Irritable</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. Ashamed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. Nervous</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. Jittery</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. Afraid</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Stigma and bias may exist at varying levels of awareness. Explicit bias is identified through self-reports of negative attitudes and toward the stigmatized group. While the individual may or may not be aware of the bias, explicit measures assess pre-existing beliefs about a stigmatized group. For obese individuals, some common negative explicit beliefs include perceptions that overweight and obese individuals lack self-control and will power, and are lazy (e.g., Latner & Stunkard, 2003; Neumark-Sztanier, Story & Harris, 1999). Conversely, implicit bias and attitudes occur automatically and often outside of conscious awareness (Greenwald & Banaji, 1995). Implicit attitudes are often measured through automatic associations one has toward a specific group (i.e., test the reaction times of memory-based automatic associations; Greenwald, McGhee & Schwartz, 1998). Evidence suggests that implicit weight-bias is common, and occurs even in the absence of reported explicit bias (Teachman & Brownell, 2001). Whether implicit or explicit, relative to thin people, obese are stereotyped as lazy versus motivated, stupid versus smart and worthless versus valuable (Teachman et al., 2003).

The data for the current investigation were collected as part of a larger investigation assessing two types of BWLPs. Due to past recruitment in similar studies (Carels et al., 2006; Carels et al., 2008; Carels et al., under review), it was anticipated that the current study would recruit about 60 participants. While it would be optimal to answer the above research questions in a sample of overweight/obese treatment seeking adults receiving an identical weight loss treatment, this was deemed unfeasible. First, it is difficult to recruit a large sample of individuals who will commit to an extended weight loss program. Second, it was our desire to avoid “competition” in recruiting participants for two studies (i.e., recruitment for the larger investigation is currently ongoing). Therefore, by collecting data for the proposed investigation
from a larger ongoing investigation, we increased the likelihood of recruitment success and thus, the feasibility of the proposed investigation. The investigator of the proposed study participated in all aspects of the larger study including program development, recruitment, data collection, implementation of the BWLPs, and independently conducted analyses for the proposed study.

Because it has been argued that not all classic assumptions of mediation must be met when assessing for suppression effects, suppression effects were examined for all variables included in the mediation analyses. No significant suppression effects were found.
Table 1
Demographic Characteristics

<table>
<thead>
<tr>
<th>Demographic</th>
<th>All Participants</th>
<th>LEARN Group</th>
<th>TYL Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>M</td>
</tr>
<tr>
<td>Female</td>
<td>44</td>
<td>81.8</td>
<td></td>
</tr>
<tr>
<td>Married/Living with Partner</td>
<td>38</td>
<td>69.1</td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>49</td>
<td>89.1</td>
<td></td>
</tr>
<tr>
<td>≥ College degree</td>
<td>47</td>
<td>85.5</td>
<td></td>
</tr>
<tr>
<td>Income ≥ $30,000</td>
<td>42</td>
<td>76.4</td>
<td></td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>47.39</td>
<td>11.72</td>
<td></td>
</tr>
<tr>
<td>Baseline weight (lbs)</td>
<td>232.24</td>
<td>49.82</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>37.20</td>
<td>6.73</td>
<td></td>
</tr>
</tbody>
</table>

+ = p<.10
Table 2
Group Differences in Baseline Measures, Weight Loss and Other Outcome Variables

<table>
<thead>
<tr>
<th></th>
<th>LEARN Group</th>
<th></th>
<th>TYL Group</th>
<th></th>
<th>t- value(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>SSI</td>
<td>0.80</td>
<td>0.60</td>
<td>1.03</td>
<td>0.70</td>
<td>-1.33</td>
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<tr>
<td>BES</td>
<td>20.07</td>
<td>6.94</td>
<td>22.30</td>
<td>7.21</td>
<td>0.57</td>
</tr>
<tr>
<td>CES-D</td>
<td>18.75</td>
<td>6.08</td>
<td>17.80</td>
<td>6.00</td>
<td>-1.12</td>
</tr>
<tr>
<td>MBSRQ – AE</td>
<td>2.07</td>
<td>0.58</td>
<td>2.03</td>
<td>0.69</td>
<td>0.19</td>
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<td>MBSRQ – AO</td>
<td>3.48</td>
<td>0.82</td>
<td>3.48</td>
<td>0.67</td>
<td>-0.02</td>
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<tr>
<td>NAS</td>
<td>21.82</td>
<td>7.57</td>
<td>20.48</td>
<td>8.91</td>
<td>0.78</td>
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<tr>
<td>Stigma from people</td>
<td>0.87</td>
<td>0.66</td>
<td>1.15</td>
<td>0.73</td>
<td>-1.44</td>
</tr>
<tr>
<td>Stigma - other</td>
<td>0.71</td>
<td>0.60</td>
<td>0.91</td>
<td>0.83</td>
<td>-1.00</td>
</tr>
<tr>
<td>Percent weight loss</td>
<td>6.63</td>
<td>4.13</td>
<td>5.35</td>
<td>4.77</td>
<td>0.99</td>
</tr>
<tr>
<td>Mean caloric intake</td>
<td>1778.74</td>
<td>504.21</td>
<td>1679.54</td>
<td>432.79</td>
<td>0.90</td>
</tr>
<tr>
<td>Mean caloric expenditure</td>
<td>2509.43</td>
<td>322.23</td>
<td>2490.12</td>
<td>352.78</td>
<td>0.20</td>
</tr>
<tr>
<td>Mean activity calories</td>
<td>624.19</td>
<td>185.82</td>
<td>605.48</td>
<td>181.74</td>
<td>0.96</td>
</tr>
</tbody>
</table>

Note. SSI = Stigmatizing Experiences; CES-D = baseline depression; BES = baseline binge eating; MBSRQ-AE = Appearance Evaluation; MBSRQ-AO = Appearance Orientation; NAS = negative affectivity
\(^a\)df = 51; * = p<.10; * = p≤.05
Table 3  
*Correlations among BMI, Stigmatizing Experiences, Potential Mediators and Treatment Outcomes*

<table>
<thead>
<tr>
<th></th>
<th>BMI</th>
<th>N</th>
<th>p-value</th>
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<tbody>
<tr>
<td>Stigmatizing experiences</td>
<td>.66**</td>
<td>52</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Stigma from people</td>
<td>.51**</td>
<td>52</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Other sources of stigma</td>
<td>.72**</td>
<td>52</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>CES-D</td>
<td>.12</td>
<td>52</td>
<td>.19</td>
</tr>
<tr>
<td>BES</td>
<td>.15</td>
<td>50</td>
<td>.15</td>
</tr>
<tr>
<td>MBSRQ-AE</td>
<td>-.42**</td>
<td>53</td>
<td>.002</td>
</tr>
<tr>
<td>MBSRQ-AO</td>
<td>.14</td>
<td>53</td>
<td>.16</td>
</tr>
<tr>
<td>NAS</td>
<td>.24*</td>
<td>51</td>
<td>.04</td>
</tr>
<tr>
<td>Percent weight loss</td>
<td>-.20+</td>
<td>49</td>
<td>.09</td>
</tr>
<tr>
<td>Average caloric intake</td>
<td>.30*</td>
<td>49</td>
<td>.02</td>
</tr>
<tr>
<td>Average caloric expenditure</td>
<td>.44**</td>
<td>49</td>
<td>.001</td>
</tr>
<tr>
<td>Average caloric expenditure through exercise</td>
<td>-.10</td>
<td>49</td>
<td>.25</td>
</tr>
</tbody>
</table>

*Note. CES-D = baseline depression; BES = baseline binge eating; MBSRQ-AE = Appearance Evaluation; MBSRQ-AO = Appearance Orientation; NAS = negative affectivity  
+ = p<.10; * = p≤.05; ** = p≤.01*
Table 4

*Pre-Intervention to Post-Intervention Changes*

<table>
<thead>
<tr>
<th></th>
<th>Pre-Intervention</th>
<th></th>
<th>Post-Intervention</th>
<th></th>
<th>t-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>CES-D</td>
<td>18.49</td>
<td>6.02</td>
<td>16.98</td>
<td>5.80</td>
<td>2.29(^a)*</td>
</tr>
<tr>
<td>BES</td>
<td>20.45</td>
<td>7.36</td>
<td>13.07</td>
<td>7.00</td>
<td>6.58(^b)**</td>
</tr>
<tr>
<td>MBSRQ-AE</td>
<td>2.09</td>
<td>0.63</td>
<td>2.78</td>
<td>0.43</td>
<td>-7.24(^a)**</td>
</tr>
<tr>
<td>MBSRQ-AO</td>
<td>3.41</td>
<td>0.73</td>
<td>2.92</td>
<td>0.42</td>
<td>6.10(^a)**</td>
</tr>
<tr>
<td>NAS</td>
<td>21.74</td>
<td>8.56</td>
<td>19.53</td>
<td>8.37</td>
<td>1.98(^c)*</td>
</tr>
<tr>
<td>Weight</td>
<td>228.48</td>
<td>43.73</td>
<td>215.20</td>
<td>47.20</td>
<td>9.07(^d)**</td>
</tr>
<tr>
<td>BMI</td>
<td>36.64</td>
<td>6.67</td>
<td>34.51</td>
<td>6.82</td>
<td>9.07(^d)**</td>
</tr>
</tbody>
</table>

*Note.* CES-D = baseline depression; BES = baseline binge eating; MBSRQ-AE = Appearance Evaluation; MBSRQ-AO = Appearance Orientation; NAS = negative affectivity

\(^a\) df = 44; \(^b\) df = 41; \(^c\) df = 42; \(^d\) df = 48

\(^* = p \leq .05; \(^{**} = p \leq .01\)
### Table 5

*Correlations between Potential Mediators*

<table>
<thead>
<tr>
<th></th>
<th>CES-D</th>
<th>BES</th>
<th>MBSRQ-AE</th>
<th>MBSRQ-AO</th>
<th>NAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CES-D</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p-value</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>55</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BES</td>
<td>.19+</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p-value</td>
<td>.09</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>52</td>
<td>53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MBSRQ-AE</td>
<td>-.04</td>
<td>-.23*</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>p-value</td>
<td>.76</td>
<td>.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>55</td>
<td>53</td>
<td>56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MBSRQ-AO</td>
<td>.06</td>
<td>.37**</td>
<td>-.23*</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>p-value</td>
<td>.69</td>
<td>.004</td>
<td>.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>55</td>
<td>53</td>
<td>56</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>NAS</td>
<td>.58**</td>
<td>.34**</td>
<td>-.29*</td>
<td>.21+</td>
<td>1.00</td>
</tr>
<tr>
<td>p-value</td>
<td>&lt;.001</td>
<td>.01</td>
<td>.04</td>
<td>.06</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>53</td>
<td>51</td>
<td>54</td>
<td>54</td>
<td>54</td>
</tr>
</tbody>
</table>

*Note.* CES-D = baseline depression; BES = baseline binge eating; MBSRQ-AE = Appearance Evaluation; MBSRQ-AO = Appearance Orientation; NAS = negative affectivity

+ = p<.10; * = p≤.05; ** = p≤.01
Table 6  
*Correlations between Stigmatizing Experiences and Potential Mediators*

<table>
<thead>
<tr>
<th>Stigmatizing Experiences</th>
<th>SSIP</th>
<th>SSIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>CES-D</td>
<td>.40**</td>
<td>.41**</td>
</tr>
<tr>
<td>BES</td>
<td>.24*</td>
<td>.16</td>
</tr>
<tr>
<td>MBSRQ-AE</td>
<td>-.35**</td>
<td>-.21</td>
</tr>
<tr>
<td>MBSRQ-AO</td>
<td>.16</td>
<td>.19</td>
</tr>
<tr>
<td>NAS</td>
<td>.31**</td>
<td>.28*</td>
</tr>
<tr>
<td>CES-D Change</td>
<td>-.13</td>
<td>-.13</td>
</tr>
<tr>
<td>BES Change</td>
<td>-.15</td>
<td>-.27*</td>
</tr>
<tr>
<td>MBSRQ-AE Change</td>
<td>-.28*</td>
<td>-.20</td>
</tr>
<tr>
<td>MBSRQ-AO Change</td>
<td>.21+</td>
<td>.23+</td>
</tr>
<tr>
<td>NAS Change</td>
<td>-.13</td>
<td>-.16</td>
</tr>
</tbody>
</table>

*Note. CES-D = baseline depression; BES = baseline binge eating; MBSRQ-AE = Appearance Evaluation; MBSRQ-AO = Appearance Orientation; NAS = negative affectivity; SSIP = Stigma from people; SSIO = Other sources of stigma  
*+ = p<.10; * = p≤.05; ** = p≤.01*
Table 7
*Relationships among Stigmatizing Experiences and Treatment Outcomes*

<table>
<thead>
<tr>
<th>Stigmatizing Experiences</th>
<th>SSIP</th>
<th>SSIO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β^a</td>
<td>t</td>
</tr>
<tr>
<td>% Weight loss</td>
<td>-.23</td>
<td>-1.56+</td>
</tr>
<tr>
<td>Caloric Intake</td>
<td>.26</td>
<td>1.77*</td>
</tr>
<tr>
<td>Caloric Expenditure&lt;sup&gt;b&lt;/sup&gt;</td>
<td>-.24</td>
<td>-1.42+</td>
</tr>
<tr>
<td>Caloric Expenditure&lt;sup&gt;b&lt;/sup&gt; Through Exercise</td>
<td>-.49</td>
<td>-2.81**</td>
</tr>
</tbody>
</table>

*Note.* SSIP = Stigma from people; SSIO = Other sources of stigma
<sup>a</sup>Standardized; <sup>b</sup>Controlling for BMI
+ = p<.10; * = p≤.05; ** = p≤.01
Table 8
Correlations between Potential Mediators and Treatment Outcomes

<table>
<thead>
<tr>
<th></th>
<th>% weight loss</th>
<th>Cal. intake</th>
<th>Cal. expenditure</th>
<th>Exercise cals</th>
</tr>
</thead>
<tbody>
<tr>
<td>CES-D</td>
<td>-.19(^+)</td>
<td>.02</td>
<td>-.27</td>
<td>-.29(^*)</td>
</tr>
<tr>
<td>BES</td>
<td>.04</td>
<td>.06</td>
<td>-.11</td>
<td>-.27(^*)</td>
</tr>
<tr>
<td>MBSRQ-AE</td>
<td>-.08</td>
<td>.09</td>
<td>.05</td>
<td>.07</td>
</tr>
<tr>
<td>MBSRQ-AO</td>
<td>.04</td>
<td>-.13</td>
<td>-.26(^+)</td>
<td>-.30(^*)</td>
</tr>
<tr>
<td>NAS</td>
<td>-.02</td>
<td>-.02</td>
<td>-.10</td>
<td>-.04</td>
</tr>
<tr>
<td>CES-D Change</td>
<td>-.20(^+)</td>
<td>.00</td>
<td>-.15</td>
<td>-.19</td>
</tr>
<tr>
<td>BES Change</td>
<td>.42(^{**})</td>
<td>-.22</td>
<td>.03</td>
<td>.06</td>
</tr>
<tr>
<td>MBSRQ-AE Change</td>
<td>-.21(^+)</td>
<td>.09</td>
<td>.07</td>
<td>.03</td>
</tr>
<tr>
<td>MBSRQ-AO Change</td>
<td>.05</td>
<td>.01</td>
<td>-.20</td>
<td>-.18</td>
</tr>
<tr>
<td>NAS Change</td>
<td>.12</td>
<td>.09</td>
<td>.12</td>
<td>.06</td>
</tr>
</tbody>
</table>

*Note.* CES-D = baseline depression; BES = baseline binge eating; MBSRQ-AE = Appearance Evaluation; MBSRQ-AO = Appearance Orientation; NAS = negative affectivity
\(^+\) = p<.10; \(^*\) = p\leq.05; \(^{**}\) = p\leq.01
Table 9
Effect of the Independent Variables on the Dependent Variables when the Mediator is Included as a Predictor

<table>
<thead>
<tr>
<th>DEPENDENT VARIABLE: % Weight loss</th>
<th>β</th>
<th>t</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Variable: Stigmatizing experiences</td>
<td>-.18&lt;sup&gt;b&lt;/sup&gt;</td>
<td>-1.16</td>
<td>.13</td>
</tr>
<tr>
<td>Potential Mediator: CES-D</td>
<td>-.12</td>
<td>-.76</td>
<td>.23</td>
</tr>
<tr>
<td>Independent Variable: Stigmatizing experiences</td>
<td>-.29&lt;sup&gt;c*&lt;/sup&gt;</td>
<td>-1.91</td>
<td>.03</td>
</tr>
<tr>
<td>Potential Mediator: MBSRQ-AE Change</td>
<td>-.28*</td>
<td>-1.84</td>
<td>.04</td>
</tr>
<tr>
<td>Independent Variable: SSIP</td>
<td>-.28&lt;sup&gt;b*&lt;/sup&gt;</td>
<td>-1.75</td>
<td>.04</td>
</tr>
<tr>
<td>Potential Mediator: CES-D</td>
<td>-.08</td>
<td>-.49</td>
<td>.31</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEPENDENT VARIABLE: Caloric expenditure</th>
<th>β</th>
<th>t</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Variable: Stigmatizing experiences</td>
<td>-.14&lt;sup&gt;b&lt;/sup&gt;</td>
<td>-.73</td>
<td>.23</td>
</tr>
<tr>
<td>Potential Mediator: CES-D</td>
<td>-.21&lt;sup&gt;+&lt;/sup&gt;</td>
<td>-1.45</td>
<td>.08</td>
</tr>
<tr>
<td>Independent Variable: SSIO</td>
<td>-.20&lt;sup&gt;b&lt;/sup&gt;</td>
<td>-1.09</td>
<td>.14</td>
</tr>
<tr>
<td>Potential Mediator: CES-D</td>
<td>-.22*</td>
<td>-1.57</td>
<td>.06</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEPENDENT VARIABLE: Caloric expenditure through exercise</th>
<th>β</th>
<th>t</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Variable: Stigmatizing experiences</td>
<td>-.41&lt;sup&gt;b*&lt;/sup&gt;</td>
<td>-2.19</td>
<td>.02</td>
</tr>
<tr>
<td>Potential Mediator: CES-D</td>
<td>-.19</td>
<td>-1.26</td>
<td>.11</td>
</tr>
<tr>
<td>Independent Variable: SSIP</td>
<td>-.25&lt;sup&gt;b+&lt;/sup&gt;</td>
<td>-1.41</td>
<td>.08</td>
</tr>
<tr>
<td>Potential Mediator: CES-D</td>
<td>-.23&lt;sup&gt;+&lt;/sup&gt;</td>
<td>-1.42</td>
<td>.08</td>
</tr>
<tr>
<td>Independent Variable: SSIO</td>
<td>-.49&lt;sup&gt;b**&lt;/sup&gt;</td>
<td>-2.56</td>
<td>.01</td>
</tr>
<tr>
<td>Potential Mediator: CES-D</td>
<td>-.23*</td>
<td>-1.64</td>
<td>.05</td>
</tr>
</tbody>
</table>

Note. CES-D = baseline depression; BES = baseline binge eating; MBSRQ_AE = Appearance Evaluation; MBSRQ-AO = Appearance Orientation; NAS = negative affectivity; SSIP = Stigma from people; SSIO = other sources of stigma

<sup>a</sup> Standardized
<sup>b</sup> relationship between IV and DV decreased when potential mediator was added
<sup>c</sup> relationship between IV and DV increased when potential mediator was added
<sup>+</sup> = p<.10; * = p<.05; ** = p<.01