Published in final edited form as:

Obesity (Silver Spring). 2014 May ; 22(5): E142–E148. doi:10.1002/oby.20617.

Weight Bias Internalization, Depression, and Self-Reported Health Among Overweight Binge Eating Disorder Patients

Rebecca L. Pearl¹, Marney A. White², and Carlos M. Grilo²

¹Yale University Department of Psychology

²Yale University Department of Psychiatry

Abstract

Objective—This study aimed to examine the relationship between internalization of weight bias, which has been linked to specific negative mental health outcomes, and overall mental and physical health among overweight patients with binge eating disorder (BED). The role of depressive symptoms as a potential mediator in this relationship was also tested.

Design and Methods—In a cross-sectional study, 255 individuals who were overweight and seeking treatment for BED completed the Weight Bias Internalization Scale (WBIS), Short-Form 36 Health Survey (SF-36), and Beck Depression Inventory II (BDI). Regression analyses were conducted to evaluate the relationship between the WBIS and the SF-36, and bootstrapping mediation analyses were conducted to test whether BDI scores mediated this relationship.

Results—Higher weight bias internalization was associated with poorer self-reported health on all scales of the SF-36, and BDI scores mediated the relationship. Additional analyses revealed that WBIS scores also mediated the relationship between BDI scores and three SF-36 scales.

Conclusions—Weight bias internalization is associated with poorer overall mental and physical health, and depressive symptoms may play a role in accounting for this relationship in treatment-seeking overweight patients with BED.

Keywords

Weight Bias; Depression; Health; Binge Eating

Weight-based prejudice is a prevalent problem that has garnered increasing concern due to its associated negative health outcomes [1]. In addition to stigmatization that individuals with obesity experience from others and society, self-directed weight stigma, also referred to as weight bias internalization, is associated with a number of these documented negative health effects [2]. Weight bias internalization has been linked to psychological problems such as depression [2–4], as well as unhealthy behaviors that may exacerbate weight problems, including binge eating [4–6].

Users may view, print, copy, and download text and data-mine the content in such documents, for the purposes of academic research, subject always to the full Conditions of use:http://www.nature.com/authors/editorial_policies/license.html#terms

Corresponding Author: Rebecca L. Pearl, Department of Psychology, Yale University, P.O. Box 208205, New Haven, CT 06520, Phone: (203) 805-8589, rebecca.pearl@yale.edu.

Competing interests: the authors have no competing interests.

In addition to specific health problems, there is evidence that internalized weight bias may exhibit a more global effect on health, as one study found that weight self-stigma mediated the relationship between body mass index (BMI) and overall health-related quality of life [7]. However, research on the relationship between weight self-stigma and health is minimal, and evidence of how weight bias internalization impacts physical health is scarce. Latner and colleagues [8] recently reported a significant negative relationship between weight bias internalization and health in a sample of weight-loss seeking adults. The authors, however, emphasized the need for further research using more comprehensive measures of health and studying more diverse samples, and especially including additional relevant variables associated with both weight bias internalization and health [8].

One such associated variable is eating pathology, and specifically binge eating. Binge eating disorder (BED) is a prevalent problem that is strongly associated with obesity and with heightened medical and psychiatric comorbidities [9, 10]. BED, a formal diagnosis in the *DSM-5*, is characterized by recurrent binge eating, marked distress, and the absence of weight compensatory behaviors (e.g., self-induced vomiting) that characterize bulimia nervosa. The subgroup of individuals with obesity who have BED have heightened distress and body image disturbances relative to individuals with obesity without BED [11], and this may make them especially sensitive or vulnerable to acquiring or internalizing negative weight-biased attitudes. Indeed, emerging research has suggested that weight bias internalization may be associated with increased binge eating behavior [4, 6] and with the diagnosis of BED [4, 12–14]. Research has indicated that treatment-seeking individuals with obesity with BED report higher rates of weight bias internalization than community samples [15], and weight bias internalization has been shown to mediate the relationship between experiences with weight discrimination and increased binge eating [16]. Despite these independent associations between binge eating and both weight bias internalization and health, no study has yet investigated the relationship between internalization and health among individuals with BED. Understanding this relationship could hold implications for informing and enhancing current treatment of BED.

In addition to the need for research examining the associations between weight bias internalization, health, and BED, there has also been a lack of investigation into the process by which internalized weight bias impacts health. Depressive symptoms may serve as one potential mediator in this relationship between weight bias internalization and negative health outcomes. Several studies have found correlations between weight bias internalization and depression [2–4, 15], although others have failed to find such a relationship [5, 6], highlighting the need for more research to understand how weight bias internalization and depression may relate. To our knowledge, no longitudinal study has investigated this relationship, but prospective research has found that adolescent girls who internalize “thin ideal” body standards and experience body dissatisfaction exhibit increased depressive symptoms over time [17]. Numerous studies have also documented causal pathways between depression and poor physical health [18]. Taken together, such findings suggest that internalization of weight bias may contribute to increased depressive symptoms, which in turn increase risk for poorer health outcomes. Evidence also suggests that among individuals with obesity, those with BED are at higher risk for depression than those without

BED [9, 19]. Thus, investigating the role of depressive symptoms in the relationship between weight bias internalization and global health outcomes in these individuals is particularly relevant and may also inform treatment.

Due to the overall lack of longitudinal research on this topic, the directionality of the relationship between depression and weight bias internalization is currently unclear. A plausible alternative hypothesis is that depressed individuals may be more prone to internalize weight bias, which may account for the observed negative health outcomes for those with depressive symptoms. Thus, it seems important for research to test for alternative directional pathways in the associations between weight bias internalization and depressive symptoms.

The present study aimed to examine associations between weight bias internalization and self-reported health, as well as to test depressive symptoms as a potential mediator in this relationship. Given the association between weight bias internalization and binge eating [1, 2, 6], we investigated this relationship in a sample of individuals who were overweight and seeking treatment for BED. Based on the breadth of evidence tying weight bias internalization to specific negative health outcomes, we hypothesized that internalization of weight bias among these individuals would show similar associations with self-reported global health. Furthermore, due to the established relationship between weight bias internalization and depression, we predicted that depressive symptoms would mediate the relationship between weight bias internalization and self-reported health. Given the cross-sectional nature of this study and the lack of previous longitudinal evidence needed to establish the directionality of this relationship, we also tested an alternative hypothesis that weight bias internalization mediates the relationship between depression and health.

Methods

Participants

Participants were 255 (73 men, 182 women; 80.8% White; age range 18–65, $M=47.94$, $SD=9.94$) treatment-seeking overweight adults who exceeded *DSM-5* diagnostic criteria for BED. Participants were recruited via newspaper advertisements to participate in a treatment research study for binge eating and weight loss at a medical school-based specialty clinic, and only data for participants who qualified for the study were included in the current research.

Procedures and Measures

Doctoral-level clinicians conducted diagnostic interviews [20] to establish the BED diagnosis and determine symptom severity, as well as measured the height and weight of all participants using a high capacity digital scale, which was used to compute BMI.

Participants completed questionnaires containing the Weight Bias Internalization Scale (WBIS), the Beck Depression Inventory II (BDI), and the Short Form 36 Health Survey (SF-36). The WBIS contains 11 items rated on a seven-point scale, has demonstrated strong construct validity and internal consistency [2], and had high internal consistency in the current sample (Cronbach's $\alpha=.85$). The BDI is a widely used self-report measure of

depressive symptoms consisting of 21 items rated on a four-point scale, with higher scores indicating more severe depressive symptoms [21]; $\alpha=.88$. The SF-36 is a reliable self-report measure of overall mental and physical health consisting of eight scales rated on a 5-point scale. These scales can be examined individually, or combined into two summary components: Physical Functioning, Role-Physical (limitations in physical role functioning), Bodily Pain, and General Health can be combined to compute the Physical Component Summary measure (PCS); Vitality, Social Functioning, Role-Emotional, and Mental Health can be used to compute the Mental Component Summary measure (MCS; [22]. PCS and MCS scores in this study were computed using a t-score algorithm [22]. For all scales, higher scores indicate better health.

Analytic Plan

We first tested for correlations between BMI and all outcome measures, as well as conducted multivariate analysis of variance (MANOVA) to test for gender differences. We also evaluated correlations between all outcome measures.

To test the hypothesis that higher WBIS scores were associated with poorer self-reported health, we constructed separate multivariate regression models for the PCS and MCS measures and the eight individual scales. We also conducted multivariate regression analyses including BED symptoms severity and an interaction term between this and WBIS scores to assess whether symptom severity impacted the relationship between weight bias internalization and self-reported health.

We then conducted bootstrapping mediation analyses recommended by Preacher and Hayes (2008) to test our hypothesis that BDI scores mediate the relationship between WBIS scores and mental and physical health. Direct and indirect effects were calculated with the SPSS macro provided by Preacher and Hayes (2008), based on 5,000 bootstrap samples and a 95% confidence interval. We conducted all analyses with and without BMI included as a covariate; due to lack of significant differences in the findings, we only present the results that include BMI in the models. For all mediation models, the SF-36 subscales served as the dependent variables and BMI was controlled for as a covariate. For the initial mediation analyses, WBIS served as the independent variable and the BDI was included as the mediator variable; to test the alternative hypothesis, we conducted mediation analyses with BDI scores as the independent variable, WBIS scores as the mediator, and the eight SF-36 subscales as the dependent variables.

Results

Participant Characteristics and WBIS

Mean BMI was 39.29 ($SD=6.03$), and based on the World Health Organization's BMI cut-off values, 98.4% of the sample was categorized as obese ($BMI > 30$) and 1.6% overweight ($25 < BMI < 30$). The mean number of days that participants reported experiencing an objective binge episode in the past month was 19.73 ($SD=15.01$). Mean WBIS score was 4.62 ($SD=1.22$), and mean BDI score was 15.08 ($SD=8.71$). Based on established cutoffs [21], 25.9% of the sample was mildly depressed ($14 \leq BDI < 20$), 18% was moderately

depressed (20 BDI < 28), and 8.2% of the sample was severely depressed (BDI ≥ 29). These rates are higher than those reported in the general United States population, which is estimated to have a 6.7% 12-month prevalence rate of depression [23].

Neither BMI nor BED symptom severity (indicated by the number of days with objective binge eating episodes in the past month) significantly correlated with WBIS scores. Analysis of variance revealed a significant difference in WBIS scores depending on participant gender, $F(1, 253)=7.74, p=.006$, Male $M=4.29, SD=1.22$, Female $M=4.76, SD=1.20$, Women in this sample also scored significantly higher on the BDI, $F(1, 253)=5.08, p=.025$, Male $M=13.15, SD=8.11$, Female $M=15.85, SD=8.85$, but there were no significant gender differences for any of the physical or mental health measures.

Correlations Between Outcome Measures

Table 1 displays the correlation between scores on the BDI and SF-36 scales. BDI scores were significantly correlated with PCS, MCS, and all eight individual physical and mental health scales, with higher ratings of depressive symptoms correlating with lower ratings of health. With the exception of the PCS and MCS measures, and the PCS and Mental Health scale, all health outcome measures were significantly correlated.

Regression Analyses

Table 2 summarizes the regression results. WBIS scores were significantly associated with all of the physical health scales but not with the PCS scores. Regression results for MCS scores and all four mental health scales were significant. For all results that were significant, WBIS scores negatively predicted ratings of physical and mental health, indicating that more weight bias internalization was associated with poorer self-reported health.

Regression analyses with the inclusion of BED symptom severity revealed no significant interaction between BED symptom severity and WBIS scores for PCS, MCS, and seven of the eight subscale scores, indicating that symptom severity did not significantly impact the relationship between weight bias internalization and health. The only exception was a significant interaction for the General Health subscale ($p=.05$), with higher BED symptoms severity and higher WBIS scores predicting worse self-reported health.

Mediation Analyses

Due to the non-significant relationship between WBIS scores and the PCS measure, we only included the four physical health scales as dependent variables (and not the PCS measure) in the mediation analyses. The WBIS did significantly correlate with the MCS measure, but since this score is a summary of the four mental health scores, only the four scales were included as dependent variables to maintain consistency and provide more detailed information about each measure of mental health.

Results from bootstrap analyses supported the hypothesis that depressive symptoms mediate the relationship between WBIS and self-reported health. Figure 1 displays the mediation models controlling for BMI as a covariate, and Table 3a summarizes the bootstrap analyses. Results revealed that the 95% percent confidence interval for the size of the indirect effects

of all of the scales excluded zero, indicating mediation [24]. For ratings of physical health, the direct effects were insignificant for all scales except Bodily Pain, which showed a positive and significant effect. For measures of mental health, direct effects for vitality and role-emotion were not significant, while direct effects for social functioning and mental health remained significant in the negative direction. Overall, the mediation models accounted for higher percentages of variance for the mental health scales than for the physical health scales.

Alternative Mediation Model—Unlike the initial mediation model, the alternative model yielded insignificant results for the majority of the subscales, with the indirect effects confidence intervals including zero. The confidence interval did not include zero for one scale assessing physical health (Bodily Pain) and two measuring mental health (Social Functioning and Mental Health). A summary of the bootstrap analyses for the alternative hypothesis is presented in Table 3b.

Discussion

Our findings suggest that weight bias internalization is associated with poorer self-reported mental and physical health. Regression analyses revealed significant negative relationships between weight bias internalization and all scales measuring physical and mental health, in addition to the MCS scores (though not PCS scores). Given that WBIS scores only explained a small proportion of the variance for the Bodily Pain scale, it is possible that when this effect was averaged together with the other physical health subscales, the overall amount of variance of PCS scores explained by WBIS scores was statistically diluted. Furthermore, bootstrap analyses revealed that depressive symptoms mediated the relationship between weight bias internalization and all scales measuring mental and physical health. Only one scale (Bodily Pain) showed a different pattern of results. Although the data most strongly supported our initial mediation hypothesis, results from additional analyses also suggested that WBIS scores mediated the relationship between depressive symptoms and worse bodily pain, social functioning, and mental health, providing some support for the alternative hypothesis. Prospective and experimental studies are needed to determine more precisely the nature of these relationships.

Our findings pertain to treatment-seeking overweight individuals with BED and may not generalize to overweight persons who do not binge eat, to non-treatment seekers, or to community samples. Study limitations include the use of self-report measures to assess weight-related bias and functioning, and the cross-sectional design, which precludes any statement regarding causality. Our findings pertain to “statistical mediation,” which have heuristic and hypothesis-generating value, but do not imply temporal causality, which would require longitudinal and experimental methods. The findings are consistent with longitudinal research that has established a causal path between thin-ideal internalization and worsening depressive symptoms [17]; however, a test of an alternative mediation model in this study provided some evidence for the role of weight bias internalization as a mediator between depression and health, and other directionalities (such as poor health mediating the relationship between weight bias internalization and depression) are feasible as well. Future research should focus on the developmental course of physical and mental health problems

associated with weight bias internalization over time in varied and diverse study groups of persons with excess weight and eating concerns. Finally, our results revealed gender differences in internalization of weight bias and depressive symptoms, but the number of men in the sample was too small to conduct mediation analyses for men and women separately. Subsequent studies should aim to include more male participants in order to determine whether weight bias internalization has a different relationship to health outcomes for men and women.

These findings have implications for advancing the understanding of the consequences of weight stigma. This study expands upon previous work describing specific health consequences of weight self-stigma by illustrating its negative relationship with overall health and functioning in a number of different domains above and beyond the effect of BMI. Given the prominent belief that weight stigma is an effective motivator for improving public health [1], this research provides an important contribution to the body of evidence suggesting that holding self-stigmatizing attitudes about being overweight may have a harmful effect on health.

Previous research has established that individuals who are overweight and internalize weight bias are more prone to experience depressive symptoms [2], but this study is the first to propose and demonstrate that these symptoms may account for, in part, the negative relationship with health outcomes. Depression has been consistently linked to poorer health outcomes, and while this relationship has been found to be bidirectional [18], more recent research has demonstrated that depression precedes specific health problems [25] and longitudinally predicts poorer health-related quality of life over and above physical illness [26, 27]. Some research has demonstrated a temporal relationship between depressive symptoms and poorer weight-loss and BED treatment outcomes [28, 29], which is consistent with the direction of the model tested in this study indicating that depression precedes negative health outcomes. Given evidence from prior research and the current study suggesting that self-directed weight stigma contributes to depressive symptoms, it may be important for clinicians to assess and target weight bias internalization among individuals who are overweight and seeking treatment for BED to prevent onset or worsening symptoms of depression. Furthermore, evidence from the alternative mediation analyses suggests that such intervention among BED patients who have depressive symptoms may help prevent worsening global health functioning.

These findings have broader implications for understanding the health consequences associated with overweight and obesity. Research has consistently documented correlations between overweight and obesity and a wide array of negative health outcomes [30], and this study suggests that self-directed weight stigma may contribute to this effect, particularly for individuals with BED. Thus, in addition to clinicians specializing in psychiatric and psychological treatment, medical professionals in primary care settings could benefit from education regarding the global health effects of weight bias internalization.

In order to develop effective strategies for reducing weight bias internalization, future research is needed to identify pathways by which individuals may internalize bias, as well as sources of bias that may contribute to self-stigmatization. For example, there is evidence that

weight bias internalization mediates the relationship between experiences of weight discrimination and associated negative outcomes such as eating disturbances [16], and media content (such as public health campaigns) frequently communicate messages of blame and shame regarding weight [31], but direct links between sources of stigmatization and self-directed stigma have not been established. Clinically, the findings might also suggest the potential relevance of using cognitive–restructuring techniques to help individuals with BED who have high levels of internalized weight bias or depressive features challenge and modify their cognitions. Such interventions could be adapted from cognitive behavioral therapy methods that have demonstrated efficacy for the treatment of BED [32]. Our findings represent new knowledge about the potential consequences of weight bias internalization while highlighting the need for further study of this issue in order to aid efforts to reduce internalization of weight bias.

Acknowledgments

Rebecca Pearl was involved in the design of this specific study, the planning and execution of the data analysis and interpretation, and held primary responsibility for writing the manuscript. Marney White was involved in the design of the study, acquisition of the data and creation of the database, editing of drafts of the manuscript, and approval of the final manuscript. Carlos Grilo was involved in the design of the study, acquisition of the data and creation of the database, editing of drafts of the manuscript, and approval of the final manuscript.

This study was funded by a grant from the National Institutes of Health (3R01 DK49587). Dr. Grilo was also supported, in part, by 2K24 DK070052.

References

1. Puhl RM, Heuer CA. Obesity Stigma: Important Implications for Public Health. *Am J Public Health*. 2010; 100:1019–28. [PubMed: 20075322]
2. Durso LE, Latner JD. Understanding Self-directed Stigma: Development of the Weight Bias Internalization Scale. *Obesity*. 2008; 16:S80–S6. [PubMed: 18978768]
3. Roberto CA, Sysko R, Bush J, et al. Clinical correlates of the weight bias internalization scale in a sample of obese adolescents seeking bariatric surgery. *Obesity*. 2012; 20:533–9. [PubMed: 21593805]
4. Scvhey NA, Roberto CA, White MA. Clinical correlates of the Weight Bias Internalization Scale in overweight adults with binge and purge behaviours. *Adv Eat Disord*. 2013
5. Carels RA, Wott CB, Young KM, et al. Implicit, explicit and internalized weight bias and psychological maladjustment among treatment-seeking adults. *Eat Behav*. 2010; 11:180–5. [PubMed: 20434066]
6. Puhl RM, Moss-Racusin CA, Schwartz MB. Internalization of Weight Bias: Implications for Binge Eating and Emotional Well-being. *Obesity*. 2007; 15:19–23. [PubMed: 17228027]
7. Lillis J, Levin ME, Hayes SC. The relationship between body mass index and health-related quality of life: A pilot study of the impact of weight self-stigma and experiential avoidance. *J Health Psychol*. 2011; 16:722–7. [PubMed: 21441358]
8. Latner JD, Durso LE, Mond JM. Health and health-related quality of life among treatment-seeking overweight and obese adults: associations with internalized weight bias. *J Eat Disord*. 2013;1. [PubMed: 24764524]
9. Hudson JI, Hiripi E, Pope HG, Kessler J, RC. The Prevalence and Correlates of Eating Disorders in the National Comorbidity Survey Replication. *Biol Psychiatry*. 2007; 61:348–58. [PubMed: 16815322]
10. Grilo CM, White MA, Masheb RM. DSM-IV Psychiatric Disorder Comorbidity and Its Correlates in Binge Eating Disorder. *Int J Eat Disord*. 2009; 42:228–34. [PubMed: 18951458]

11. Grilo CM, Hrabosky JI, White MA, et al. Overvaluation of Shape and Weight in Binge Eating Disorder and Overweight Controls: Refinement of a Diagnostic Construct. *J Abnorm Psychol.* 2008; 117:414–9. [PubMed: 18489217]
12. Friedman KE, Ashmore JA, Applegate KL. Recent Experiences of Weight-based Stigmatization in a Weight Loss Surgery Population: Psychological and Behavioral Correlates. *Obesity.* 2008; 16:S69–S74. [PubMed: 18978766]
13. Ashmore JA, Friedman KE, Reichmann SK, Musante GJ. Weight-based stigmatization, psychological distress, & binge eating behavior among obese treatment-seeking adults. *Eat Behav.* 2008; 9:203–9. [PubMed: 18329599]
14. Annis NM, Cash TF, Hrabosky JI. Body image and psychosocial differences among stable average weight, currently overweight, and formerly overweight women: the role of stigmatizing experiences. *Body Image.* 2004; 1:155–67. [PubMed: 18089148]
15. Durso LE, Latner JD, White MA, et al. Internalized Weight Bias in Obese Patients with Binge Eating Disorder: Associations with Eating Disturbances and Psychological Functioning. *Int J Eat Disord.* 2012; 45:423–7. [PubMed: 21717488]
16. Durso LE, Latner JD, Hayaski K. Perceived Discrimination is Associated with Binge Eating in a Community Sample of Non-Overweight, Overweight, and Obese Adults. *Obes Facts.* 2012; 5:869–80. [PubMed: 23258192]
17. Stice E, Bearman SK. Body-Image and Eating Disturbances Prospectively Predict Increases in Depressive Symptoms in Adolescent Girls: A Growth Curve Analysis. *Dev Psychol.* 2001; 37:597–607. [PubMed: 11552756]
18. Evans DL, Charney DS, Lewis L, et al. Mood Disorders in the Medically Ill: Scientific Review and Recommendations. *Biol Psychiatry.* 2005; 58:175–89. [PubMed: 16084838]
19. Javaras KN, HG, Pope J, Lalonde JK, et al. Co-Occurrence of Binge Eating Disorder with Psychiatric and Medical Disorders. *J Clin Psychiatry.* 2008; 69:266–73. [PubMed: 18348600]
20. First, MB.; Spitzer, RL.; Gibbon, M.; Williams, JBW. Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Patient Edition (SCID-I/P). New York: Biometrics Research, New York State Psychiatric Institute; 2002.
21. Beck, AT.; Steer, RA.; Brown, GK. Manual for the BDI-II. 1996.
22. Ware JE. SF-36 Health Survey Update. *Spine.* 2000; 25:3130–9. [PubMed: 11124729]
23. Kessler RC, Chiu WT, Demier O, Walters EE. Prevalence, Severity, and Comorbidity of Twelve-month DSM-IV Disorders in the National Comorbidity Survey Replication (NCS-R). *Arch Gen Psychiatry.* 2005; 62:617–27. [PubMed: 15939839]
24. Preacher KJ, Hayes AF. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behav Res Methods.* 2008; 40:879–91. [PubMed: 18697684]
25. O'Neil A, Williams ED, Stevenson CE, et al. Co-morbid cardiovascular disease and depression: sequence of disease onset is linked to mental but not physical self-rated health. Results from a cross-sectional, population-based study. *Soc Psychiatry Psychiatr Epidemiol.* 2012; 47:1145–51. [PubMed: 21830082]
26. Linde JA, Jeffery RW, Levy RL, et al. Binge eating disorder, weight control self-efficacy, and depression in overweight men and women. *Int J Obes.* 2004; 28:418–25.
27. Moussavi S, Chatterji S, Verdes E, et al. Depression, chronic diseases, and decrements in health: results from the World Health Surveys. *The Lancet.* 2007; 370:851–8.
28. Grilo CM, Masheb RM, Crosby RD. Predictors and moderators of response to cognitive behavioral therapy and medication for the treatment of binge eating disorder. *J Consult Clin Psychol.* 2012; 80:897–906. [PubMed: 22289130]
29. Pagoto S, Bodenlos JS, Kantor L, et al. Association of Major Depression and Binge Eating Disorder with Weight Loss in a Clinical Setting. *Obesity.* 2007; 15:2557–9. [PubMed: 18070746]
30. The Surgeon General's Vision for a Healthy and Fit Nation. Rockville, MD: U.S. Department of Health and Human Services, Office of the Surgeon General; 2010.
31. Puhl R, Peterson JL, Luedicke J. Fighting obesity or obese persons? Public perceptions of obesity-related health messages. *Int J Obes.* 2012

32. Grilo CM, Crosby RD, Wilson GT, Masheb RM. 12-Month Follow-Up of Fluoxetine and Cognitive Behavioral Therapy for Binge Eating Disorder. *J Consult Clin Psychol.* 2012; 80:1108–13. [PubMed: 22985205]

What is Known About the Subject

- Weight bias internalization is associated with specific negative mental health and physical health symptoms, including depressive symptoms, among individuals who are overweight.
- Weight bias internalization is prevalent among individuals with binge eating disorder (BED), and is associated with eating pathology and depression among these individuals.

What This Study Adds

- Weight bias internalization negatively predicts overall physical and mental health among individuals who are overweight and seeking treatment for BED.
- Depressive symptoms mediate the relationship between weight bias internalization and self-reported health.
- Weight bias internalization mediates the relationship between depression and certain health outcomes.

Figure 1.

Depressive symptoms mediate the effect of the weight bias internalization on self-reported physical and mental health. Unstandardized coefficients are provided. Figure 1a displays results for physical health; Figure 1b displays results for mental health. Body mass index is not included in the figure, but all results were computed with BMI as a covariate.

Table 1

Means, Standard Deviations, and Correlations Between Outcome Measures

Variables	Mean (SD)	BDI	Mental Health	Role-Emotional	Social Functioning	Vitality	MCS	General Health	Bodily Pain	Role-Physical	Physical Functioning
PCS	43.97 (10.18)	-.36**	.04	.14**	.37**	.45**	-.07	.56**	.71**	.74**	.82**
Physical Functioning	68.93 (25.18)	-.44**	.28**	.34**	.47**	.46**	.17**	.40**	.50**	.60**	
Role-Physical	60.10 (40.22)	-.48**	.28**	.51**	.47**	.44**	.30**	.37**	.47**		
Bodily Pain	59.75 (24.14)	-.41**	.21**	.26**	.44**	.39**	.17**	.33**			
General Health	61.48 (18.72)	-.43**	.33**	.19**	.33**	.45**	.25**				
MCS	42.30 (11.14)	-.66**	.84**	.81**	.69**	.50**					
Vitality	37.48 (19.91)	-.56**	.47**	.34**	.40**						
Social Functioning	67.45 (27.74)	-.62**	.53**	.56**							
Role-Emotional	57.78 (42.96)	-.55**	.51**								
Mental Health	63.40 (18.67)	-.63**									

** $P < .01$ * $P < .05$

SD: Standard Deviation; PCS: SF-36 Physical Composite Score; MCS: SF-36 Mental Composite Score; BDI: Beck Depression Inventory

Table 2

Summary of Regression Results

Dependent Variable	Model R ²	F	Step	R ² Change	F Change	IV	Standardized β
Physical Health Component	.07	9.87**	1	.07	18.02***	BMI	-.026***
			2	.01	1.67	BMI	-.025***
						WBIS	-.008
Physical Functioning	.11	16.17***	1	.07	19.92***	BMI	-.027***
			2	.04	11.58***	BMI	-.026***
						WBIS	-.020***
Role-Physical	.08	10.34***	1	.01	3.17	BMI	-.011
			2	.06	17.31***	BMI	-.009
						WBIS	-.025***
Bodily Pain	.03	3.52*	1	.01	2.43	BMI	-.010
			2	.02	4.59*	BMI	-.009
						WBIS	-.013*
General Health	.07	9.75***	1	.03	7.34**	BMI	-.017***
			2	.04	11.85***	BMI	-.015**
						WBIS	-.021***
Mental Health Component	.29	51.27***	1	.01	1.37	BMI	.07
			2	.28	100.63***	BMI	.11*
						WBIS	-.053***
Vitality	.09	12.50***	1	.01	1.65	BMI	-.008
			2	.08	23.20***	BMI	-.006
						WBIS	-.029***
Social Functioning	.22	39.55***	1	.01	3.15	BMI	-.011
			2	.21	69.10***	BMI	-.008

Dependent Variable	Model R ²	F	Step	R ² Change	F Change	IV	Standardized β
Role-Emotion	.16	24.28***	1	.00	.02	WBIS	-.046***
			2	.16	48.52***	BMI	-.001
						BMI	-.002
Mental Health	.26	44.12***	1	.01	2.05	WBIS	-.040***
			2	.25	85.50***	BMI	.09
						BMI	.13*
						WBIS	-.050***

*** $P < .001$

** $P < .01$

* $P < .05$

Table 3a

Summary of Bootstrapping Results for Main Hypothesis

Dependent Variable	Model R ²	F	Total Effect Coefficient	Bias Corrected Indirect Effect	Confidence Interval	Direct Effect Coefficient	Partial Effect of BMI
Physical Health Scales							
Physical Functioning	.24	26.93***	-4.18***	(-7.51, -3.94)		1.43	-0.93***
Role-Physical	.23	25.45***	-8.34***	(-13.03, -7.15)		1.53	-0.37
Bodily Pain	.19	19.36***	-2.64*	(-8.07, -3.81)		3.34*	-0.20
General Health	.20	21.13***	-3.22***	(-5.83, -2.79)		0.95	-0.37*
Mental Health Scales							
Vitality	.32	39.44***	-4.74***	(-7.50, -4.57)		1.16	-0.05
Social Functioning	.40	55.86***	-10.52***	(-9.47, -5.28)		-3.34*	-0.18
Role-Emotion	.32	38.70***	-14.20***	(-13.45, -7.42)		-3.75	0.40
Mental Health	.45	67.36***	-7.70***	(-6.40, -3.70)		-2.71**	0.52***

* $P < .05$

** $P < .01$

*** $P < .001$

Table 3b

Summary of Bootstrapping Results for Alternative Hypothesis

Dependent Variable	Model R ²	F	Total Effect Coefficient	Bias Corrected Indirect Effect	Confidence Interval	Direct Effect Coefficient	Partial Effect of BMI
Physical Health Scales							
Physical Functioning	.24	26.93***	-1.19***	(-0.12, 0.35)		-1.31***	-0.93***
Role-Physical	.23	25.45***	-2.18***	(-0.27, 0.54)		-2.31***	-0.37
Bodily Pain	.19	19.36***	-1.12***	(0.01, 0.56)		-1.40***	-0.20
General Health	.20	21.13***	-0.89***	(-0.11, 0.27)		-0.98***	-0.37*
Mental Health Scales							
Vitality	.32	39.44***	-1.28***	(-0.08, 0.28)		-1.38***	-0.05
Social Functioning	.40	55.86***	-1.96***	(-0.55, -0.03)		-1.68***	-0.18
Role-Emotion	.32	38.70***	-2.76***	(-0.75, 0.06)		-2.44***	0.40
Mental Health	.45	67.36***	-1.40***	(-0.42, -0.06)		-1.17***	0.52***

* $P < .05$

** $P < .01$

*** $P < .001$