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Overvaluation of Weight or Shape and Loss-of-Control Eating Following Bariatric Surgery

Valentina Ivezaj, Ph.D.¹, Ashley A. Wiedemann, Ph.D.¹, Carlos M. Grilo, Ph.D.^{1,2}

¹Yale School of Medicine, New Haven, CT, 06519

²Yale University, New Haven, CT, 06511

Abstract

Objective: Little is known regarding overvaluation of weight/shape, a key cognitive feature of eating disorders, among individuals with disordered eating following bariatric surgery. This study examined the significance of overvaluation of weight/shape among post-bariatric surgery patients with loss-of-control (LOC) eating.

Methods: Participants were 145 individuals who underwent sleeve gastrectomy within the previous six months and reported regular LOC eating. Overvaluation of weight/shape, LOC eating, and eating-disorder psychopathology were assessed using the Eating Disorder Examination (EDE)-Bariatric-Surgery-Version interview; depressive symptoms and disability were assessed by the Beck Depression Inventory (BDI-II) and Sheehan Disability Scale (SDS), respectively.

Results: Overvaluation of weight/shape, examined continuously, was correlated significantly with higher levels of eating-disorder psychopathology (EDE), depression (BDI-II) and disability (SDS). Categorically, using established clinical cut-points, relative to the Subclinical Overvaluation group ($n=70$, 48.3%), the Clinical Overvaluation group ($n=75$, 51.7%) reported significantly greater frequency of LOC eating episodes and higher EDE, BDI-II, and SDS scores. The two groups did not differ significantly in current BMI or percent weight-loss following surgery.

Conclusion: Our findings, which highlight the clinical significance of overvaluation of weight/shape among patients with LOC eating following bariatric surgery, are similar to those previously reported for binge-eating disorder. Post-operatively, overvaluation of weight/shape was associated with greater eating-disorder psychopathology, depression, and disability.

Keywords

obesity; bariatric surgery; overvaluation; binge-eating

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Correspondence should be addressed to Valentina Ivezaj, Ph.D., Yale School of Medicine, 301 Cedar Street, 2nd Floor, New Haven, CT 06519. valentina.ivezaj@yale.edu.

Introduction

Overvaluation of weight/shape is defined as when individuals' self-evaluation or self-worth is predominately or overly based on their weight/shape [1]. Although associated with the broader concept of body-image dissatisfaction, overvaluation of weight/shape is a distinctly specific construct, more strongly related to self-esteem, and viewed as a core cognitive feature of some eating disorders [2, 3]. Overvaluation, which distinguishes patients with eating disorders from controls [4, 5], is a required diagnostic criterion for bulimia nervosa and anorexia nervosa in the *Diagnostic and Statistical Manual of Mental Disorders – Fifth Edition (DSM-5)* [6]. In other eating disorders that do not require overvaluation for the diagnosis, such as binge-eating disorder (BED), the presence of overvaluation has been found to be associated with greater psychopathology and severity [7–12] and to prospectively predict poorer treatment outcomes [13, 14].

Much of the literature on overvaluation has focused on eating disorder and/or obesity study groups and very little is known about overvaluation among individuals who undergo bariatric surgery and particularly those who struggle with controlling their eating post-operatively. Both disordered eating and LOC eating are associated with poorer long-term weight outcomes after surgery [15–18]. Emerging evidence suggests that careful attention during the post-operative period is warranted as problematic eating behaviors might hinder weight loss [19]. To our knowledge, no studies have yet examined the significance of overvaluation among individuals struggling with disordered eating following bariatric surgery.

The purpose of this study was to examine the significance of overvaluation of weight/shape among post-operative bariatric surgery patients with loss-of-control (LOC) eating. The aims of this investigation were to: (1) Examine the frequency of overvaluation of weight/shape among patients with LOC following bariatric surgery, (2) examine associations between overvaluation and clinical features (i.e., eating-disorder psychopathology, depressive symptoms, and functioning), and (3) Compare weight and clinical features among patients with and without clinical levels of overvaluation after bariatric surgery.

Methods

Participants

Participants were 145 adults (aged 18–65) who underwent sleeve gastrectomy surgery approximately six months prior ($M=6.3$, $SD=1.5$; range 4–9 months) at the Yale Bariatric/Gastrointestinal Surgery Center of Excellence and were seeking treatment for eating and weight concerns. All participants experienced regular LOC eating, defined as at least once weekly during the prior 28 days. Exclusion criteria included any use of medications known to effectively influence weight or eating, current substance dependence, or severe psychiatric illness requiring immediate treatment. Recruitment methods included direct referrals from the bariatric team and/or mailings and flyers advertising a study on postoperative eating concerns. All study procedures were conducted independently from the bariatric program. The study received Institutional Review Board approval and written informed consent was provided by all participants.

The majority of participants were female ($n=120$, 82.8%) and were comprised of diverse racial identities (White: $n=78$; 53.8%; Black or African American: $n=51$; 35.2%; Other: $n=10$, 6.9%, Bi/Multi-racial: $n=3$; 2.1%, American Indian or Alaska Native: $n=2$; 1.4%; Native Hawaiian or Other Pacific Islander: $n=1$, 0.7%). Of the overall group, 9.7% ($n=14$) identified as Latino or Hispanic. Average BMI was in the obesity range ($M=37.7$, $SD=7.3$).

Procedures and assessments

Participants were assessed by doctoral-level therapists with advanced training in eating and weight disorders. Weight was collected at the evaluation using a high-capacity digital scale, while height and pre-surgical measured weight were obtained from the bariatric surgery center of excellence.

Weight change variables.—Current Body Mass Index (BMI) (approximately six months post-operatively) and pre-operative BMI were used to calculate BMI Change. Percent Total Weight Loss (%TWL) was determined based on the following formula $[(\text{Pre-Operative Weight}) - (\text{Postoperative Weight})]/[(\text{Pre-Operative Weight})]*100$. All weight and height variables were measured by trained clinicians (i.e., not self-report).

Investigator-Based Interviews.—The **Eating Disorder Examination (EDE) – Bariatric-Surgery-Version**, a semi-structured interview modified for bariatric surgery patients [15, 20, 21], was used to assess LOC eating episodes and eating-disorder psychopathology. LOC eating was defined as feeling a sense of LOC while eating, difficulty stopping or inability to stop eating, or inability to prevent eating regardless of the quantity of food consumed. Frequency of LOC eating episodes during the prior 28 days was obtained. In addition, the standard EDE global severity score comprised of the average of four subscales, was computed; scores range from 0 to 6, with higher scores suggesting greater severity. The EDE also assesses overvaluation of weight and overvaluation of shape with two items (which include several follow-up prompts and queries to clarify the concepts and to rate the presence/severity of the concerns) to determine level/severity of overvaluation of weight and shape. Scores range from 0–6 with a clinical cut-point of 4 to categorize clinical levels of overvaluation [7, 22]. Most research has used this convention (e.g., [9]). The **Mini-International Psychiatric Interview (MINI)** [23], a widely-used structured interview for determining psychiatric diagnosis based on the *DSM-5*, was administered to assess lifetime (pre-surgical) BED. Interviews were conducted by post-doctoral assessors trained in diagnostic interviewing, including use of the MINI, and in working with patients with eating/weight concerns.

Self-Report Measures.—The **Beck Depression Inventory-Second Edition (BDI-II)** is a widely used 21-item self-report measure assessing current depressive symptomatology during the past two weeks [24]. Higher scores signify greater depressive symptomatology and capture a broad range of negative affect and psychopathology among bariatric patients [25]. Scores of 0–13 represent scores in the minimal depression range, 14–19 in the mild depression range, 20–28 in the moderate depression range, and 29–63 in the severe depression range. The **Sheehan Disability Scale (SDS)** [26] is a well-established measure of functioning in multiple life domains including work/school, social life/leisure activities, and

family life/home responsibilities. Participants are asked to identify how a particular concern or issue affects these different domains. For this study, participants were asked how their weight impacts each domain (SDS-Weight) and how their eating behaviors (e.g., loss-of-control eating, binge-eating, etc.) or feelings about eating, shape, or weight impacts each domain (SDS-Eating). Responses are based on an 11-point scale ranging from “0” (no impairment) to “10” (extreme impairment), with total scores ranging from 0–30. Higher scores are indicative of greater disability/poorer functioning.

Statistical Analyses: Data were analyzed using SPSS 24.0. Bivariate correlations examined the association between overvaluation of weight or shape (measured continuously) and the demographic variables (e.g., age), weight variables, eating-disorder psychopathology (EDE), depression (BDI-II), and disability/functioning (SDS-Weight, SDS-Eating). Independent samples *t*-tests were used to compare demographic and clinical variables between those with and without clinical levels of overvaluation. Analyses with the EDE-Global scale were conducted *both* with and without the two overvaluation items to ensure that the group differences were not partly due to the item overlap. A Bonferroni adjustment was also used for multiple comparisons with a *p*-value of .01.

Results

Mean overall scores of overvaluation of weight and shape were in the subclinical range ($M=2.8$, $SD=2.0$ and $M=2.7$, $SD=2.1$), respectively. Of the overall participant group, $n=75$ (51.7%) endorsed clinical levels of overvaluation of weight *or* shape, $n=61$ (42.1%) endorsed clinical levels of overvaluation of weight, $n=62$ (42.8%) endorsed clinical levels of overweight of shape, and $n=48$ (33.1%) reported clinical levels of both weight *and* shape. $n=24$ (16.6%) reported no overvaluation of weight or shape.

The parallel analyses with and without the overvaluation items in the EDE-Global scale score yielded similar findings. Thus, we report here findings regarding the EDE-Global scale based on the composite score *without* the overvaluation items.

Overvaluation of weight or shape was not associated significantly with age ($r=.529$, $p=.053$), BMI ($r=.029$, $p=.730$), %TWL ($r=-.035$, $p=.675$), time since surgery ($r=-.025$, $p=.768$), or onset of post-surgical LOC eating ($r=-.067$, $p=.426$). Overvaluation of weight or shape was associated significantly with greater frequency of LOC eating ($r=.228$, $p=.006$), EDE-Global ($r=.518$, $p<.0005$), BDI-II ($r=.399$, $p<.005$), SDS-Weight ($r=.314$, $p<.0005$), and SDS-Eating ($r=.322$, $p<.0005$).

Table 1 summarizes demographic and weight change variables overall and by group (participants with and without clinical levels of overvaluation). There were no significant differences in age, gender, race, time since surgery, or any of the weight change variables including pre-surgical BMI, current BMI, BMI change, or %TWL between those categorized with and without clinical levels of overvaluation.

Table 2 shows the means and standard deviations of eating-disorder psychopathology, depressive symptoms, and disability/functioning based on weight and eating concerns and proportion of individuals with lifetime BED overall and by group (with and without clinical

levels of overvaluation). Participants with clinical levels of overvaluation of weight or shape endorsed significantly greater scores on all clinical measures including the EDE-Global, BDI-II, SDS-Weight, and SDS-Eating scores, greater frequency of LOC eating behaviors, and were significantly more likely to have a history of BED. The effect size for eating-disorder psychopathology was in the large range, while effect sizes for LOC eating behavior, depressive symptoms, and disability/functioning were in the small range.

With the use of the conservative Bonferroni adjustment for multiple comparisons ($p < .01$), significant group differences remained for EDE-Global ($p < .0005$); however, the group differences for LOC eating ($p = .017$), BDI-II ($p = .012$), and SDS-Eating ($p = .015$) became non-significant trends and the group differences in SDS-Weight ($p = .041$) became non-significant using the adjusted lower p -level.

Discussion

This study examined overvaluation of weight/shape among patients with LOC eating following sleeve gastrectomy surgery. On average, subclinical levels of overvaluation of weight or shape were reported and roughly half (52%) endorsed clinical levels of overvaluation of weight/shape. Overvaluation, when examined continuously, was associated significantly with greater eating-disorder psychopathology, including more frequent LOC eating, and with greater depressive symptomatology and disability/poorer functioning due to weight and eating; overvaluation was not, however, associated significantly with either BMI or weight loss following surgery. The lack of association between overvaluation and BMI (and weight loss) is important as it indicates that this specific cognitive construct – unlike body dissatisfaction – is not merely weight dependent or a proxy for excess weight [9, 10]. Similarly, when considered categorically, individuals with clinical levels of overvaluation of weight/shape reported greater levels of eating-disorder behavior and psychopathology, including greater proportion with pre-surgical lifetime diagnoses of BED, greater disability related to weight and eating concerns, and greater depressive symptoms. In fact, the group with clinical overvaluation reported depressive symptoms in the mild range while the group without clinical overvaluation reported depressive symptoms in the minimal range, although the effect size was just in the small-to-medium range. Importantly, the effect size for group differences in eating-disorder psychopathology was large while the relationship between pre-surgical BED and post-operative clinical overvaluation was weak. Our findings regarding the clinical significance of overvaluation of weight/shape for patients with LOC eating following bariatric surgery closely parallel those previously reported for individuals with binge-eating disorder [7, 8, 10–12].

In addition to replicating and extending the literature on overvaluation of weight/shape to a unique and clinically-relevant subgroup of bariatric patients (i.e., those experiencing LOC eating post-operatively), our study extends the overall literature on overvaluation by examining functional impairment. In the present study, overvaluation (when examined continuously or categorically) was associated with reports of poorer functioning in various life domains including work/school, social life/leisure activities, and family life/home responsibilities due to weight and eating concerns, albeit with small effects. Thus, our findings suggest overvaluation of weight/shape is a useful signal for broader levels of

impairment. Improved understanding of overvaluation among this patient group may help inform treatment needs of patients struggling with disordered eating and associated features following bariatric surgery. For instance, individuals with overvaluation of weight/shape after bariatric surgery might benefit from cognitive behavioral therapy, an evidence-based treatment for disordered eating [27] or by tailoring/incorporating coping and skills-building methods to enhance activities and functioning.

Study strengths and limitations are important context when interpreting results. Strengths include the use of the rigorous interview method to assess eating-disorder behaviors and psychopathology as well as the use of well-established self-report instruments for depression and disability. In addition, this study involved individuals who underwent the laparoscopic sleeve gastrectomy surgery, currently the most commonly performed bariatric surgical procedure in the United States [28], and experienced regular LOC eating. Generalizability to other bariatric procedures or to bariatric patients without LOC eating is uncertain. Although this study included a diverse bariatric patient group, Latinx/Hispanic adults were underrepresented. Furthermore, this study employed a cross-sectional design and the period of follow-up was brief; future studies with diverse patients examining the prognostic significance of overvaluation among individuals with and without LOC eating throughout the process and course following bariatric surgery are needed.

With the use of the conservative Bonferroni adjustment for multiple comparisons ($p < .01$), significant group differences remained for eating-disorder psychopathology, while group differences in LOC eating, depressive symptoms, and disability became non-significant trends using the adjusted lower p -level. Importantly, however, adjustments for multiple comparisons are not necessarily warranted for exploratory studies or post-hoc analyses of existing data [29]. Nonetheless, future studies with a priori hypotheses should be conducted to confirm the present findings.

Conclusion

Roughly half of patients experiencing LOC eating at approximately six months following sleeve gastrectomy surgery met clinical levels of overvaluation of weight/shape. Overvaluation was associated with significantly greater eating-disorder psychopathology, poorer psychological functioning, and greater impairment across multiple life domains. Assessment of overvaluation of weight or shape following bariatric surgery may provide useful clinical information to identify patients with potentially greater clinical needs across an array of domains and may inform more targeted treatments. Moreover, the combination of overvaluation and LOC eating six months post-operatively might serve as a marker for diminished functioning. To date, no studies have prospectively examined overvaluation of weight or shape from the pre-operative phase to the acute and longer-term post-operative phase. Future research is needed to examine the prognostic significance of pre-surgical or early post-surgical overvaluation of weight/shape among a general bariatric population with and without disordered eating. Longer-term follow-up is needed to ascertain potential effects on weight loss and associated outcomes.

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What is already known about this subject?

- Despite the overall effectiveness of bariatric surgery, outcomes remain variable.
- Loss-of-control eating is a consistent predictor of suboptimal weight outcomes after bariatric surgery, but little is known regarding associated cognitive features.
- In the non-bariatric obesity literature, overvaluation of weight/shape is strongly associated with loss-of-control eating (and/or binge eating).

What does this study add?

- This is the first study to examine group differences in disability/impairment, depression, and eating-disorder features based on overvaluation and loss-of-control eating status.
- Our findings highlight the clinical significance of overvaluation of weight/shape following bariatric surgery.
- Post-operative overvaluation of weight/shape was associated with greater disability, depression, and eating-disorder psychopathology.

Table 1.

Demography and weight variables by overvaluation status

	Overall	Subclinical Overvaluation		Clinical Overvaluation		Independent samples t-test		<i>p-value</i>
	<i>N</i> =145 <i>M</i> (<i>SD</i>)	<i>n</i> =70 <i>M</i> (<i>SD</i>)	<i>n</i> =75 <i>M</i> (<i>SD</i>)	<i>n</i> =70 <i>M</i> (<i>SD</i>)	<i>n</i> =75 <i>M</i> (<i>SD</i>)	<i>t</i>	<i>p-value</i>	
Age	45.41 (11.18)	45.10 (11.52)	45.71 (10.91)			-.326	.745	
Pre-surgical BMI	46.84 (8.89)	46.75 (9.07)	46.92 (8.78)			-.118	.906	
Post-surgical BMI	37.68 (7.28)	37.67 (7.51)	37.70 (7.11)			-.022	.982	
BMI change	9.16 (4.05)	9.08 (4.03)	9.23 (4.08)			-.218	.828	
%TWL	19.30 (6.93)	19.25 (7.03)	19.34 (6.89)			-.079	.937	
Time since surgery	6.34 (1.51)	6.24 (1.49)	6.43 (1.54)			-.729	.467	
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)			Chi-Square	<i>p-value</i>	
Gender (Female)	120 (82.8%)	58 (82.9%)	62 (82.7%)			.001	.976	
Race (White)	74 (51.0%)	37 (52.9%)	37 (49.3%)			.180	.671	

Eating-disorder psychopathology, depressive symptoms, and disability/functioning by overvaluation status

Table 2.

	Overall		Subclinical Overvaluation		Clinical Overvaluation		Independent samples		Effect Size	
	<i>N</i> =145	<i>M</i> (<i>SD</i>)	<i>n</i> =70	<i>M</i> (<i>SD</i>)	<i>n</i> =75	<i>M</i> (<i>SD</i>)	<i>t</i> -test	<i>p</i> -value	<i>p</i> -value	<i>Cohen's d</i>
EDE-Global (without overvaluation)	2.13 (0.98)		1.74 (0.86)		2.50 (0.94)		-5.12	<.0005		0.84
LOC eating episodes	21.61 (20.45)		17.96 (18.00)		25.01 (22.08)		-2.42	.017		0.42
BDI-II	12.11 (10.32)		9.76 (9.13)		14.21 (10.92)		-2.56	.012		0.44
SDS- Weight	15.92 (20.59)		12.16 (18.68)		19.24 (21.74)		-2.06	.041		0.36
SDS-Eating	12.75 (20.51)		7.68 (15.73)		17.24 (23.16)		-2.47	.015		0.43
	<i>N</i> (%)		<i>n</i> (%)		<i>n</i> (%)		Chi-Square	<i>p</i> -value		<i>Phi</i>
Lifetime (pre-surgical) Binge-Eating Disorder	69 (47.9%)		25 (36.2%)		44 (63.8%)		7.25	.007		.224
Current (post-surgical) Binge-Eating Disorder	8 (5.5%)		1 (12.5%)		7 (87.5%)		NA ^b	NA ^b		NA ^b

Note. EDE=Eating Disorder Examination; LOC = loss-of-control; LOC eating episodes during the past 28 days. BDI-II = Beck Depressive Inventory II; SDS=Sheehan Disability Scale

^b Cells too small to run statistical analyses