


Psychosocial predictors of problematic eating in young adults who underwent adolescent bariatric surgery

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Abstract

Introduction: This study examined problematic eating and eating-related psychopathology among young adults who underwent adolescent bariatric surgery including concurrent and prospective associations with psychosocial factors and weight change.

Methods: VIEW point is a 6-year follow-up study within a prospective observational study series observing adolescents with severe obesity who had bariatric surgery ($n = 139$) or who presented to nonsurgical lifestyle modification programs ($n = 83$). Participants completed height/weight measurements, questionnaires, and diagnostic interviews. Regression analyses compared problematic eating across groups and examined Year 6 correlates (i.e., psychosocial factors and weight change) and baseline predictors (i.e., psychosocial factors) of eating-related psychopathology.

Results: Compared to the nonsurgical group, the surgical group reported lower eating-related psychopathology, objective binge eating, and grazing at Year 6. While chewing/spitting out and vomiting for weight/shape-related reasons were very infrequent for the surgical group, self-induced vomiting for other reasons (e.g., avoid plugging) was more common. For the surgical group, lower self-worth, greater internalizing symptoms, and higher weight-related teasing in adolescence predicted increased eating-related psychopathology in young adulthood. Year 6 eating-related psychopathology was concurrently associated with lower percent weight loss for the surgical group and greater percent weight gain for the nonsurgical group.

Conclusion: Undergoing adolescent bariatric surgery appears to afford benefit for problematic eating and eating-related psychopathology. Current findings suggest that the clinical intervention related to problematic eating and associated psychosocial concerns may be needed for young adults with obesity, regardless of surgical status.

Abbreviations: AMOS, Adolescent Morbid Obesity Study; BMI, body mass index; EDE-BSV, Eating Disorder Examination-Bariatric Surgery Version; LOC, loss of control; QEWP-R, Questionnaire on Eating and Weight Patterns-Revised; Teen-LABs, Teen Longitudinal Assessment of Bariatric Surgery; WRQOL, weight-related quality of life.

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KEYWORDS

metabolic and bariatric surgery, problematic eating, severe obesity, young adulthood

1 | INTRODUCTION

Problematic eating behaviors such as overeating and binge eating are common among youth with higher weight¹ and may persist and increase from adolescence to young adulthood.² These behaviors can detrimentally impact physical and psychosocial functioning³ including increasing risk for development of full-syndrome eating disorders,⁴ which impact 55.5 million individuals worldwide.⁵ In the United States, adolescent severe obesity (7.7% prevalence, body mass index [BMI] >120% of the sex-specific 95th percentile)⁶ and associated health conditions are of high public health concern as they are typically carried into young adulthood⁷ without successful intervention. While bariatric surgery is a highly effective treatment for improved health and quality of life for adolescents with severe obesity,⁸ problematic eating behaviors may attenuate surgery benefits. Unfortunately, we know little about the impact of such behaviors in these uniquely high-risk clinical populations, young adults who underwent bariatric surgery and those with persistent, severe obesity.

Presurgery prevalence of problematic eating behaviors (e.g., loss of control [LOC] eating, binge eating) among adolescents in the United States^{9,10} appear similar to rates among nonsurgical samples of youth with overweight or obesity¹ but higher than the general adolescent population.² Early research among adolescents who underwent laparoscopic adjustable gastric banding highlighted that presurgical LOC eating was associated with poorer postsurgical BMI change¹¹ and early dropout from postsurgical treatment.¹² Recent work from prospective longitudinal cohorts in the United States (Teen Longitudinal Assessment of Bariatric Surgery [Teen-LABS])^{9,13} and Sweden (Adolescent Morbid Obesity Study [AMOS])¹⁴ has indicated that problematic eating behaviors (e.g., LOC, binge eating) decreased dramatically from pre to postsurgery (4–6 years) and postsurgical problematic eating was associated with poorer weight loss outcomes.^{9,14}

This prior work provides invaluable insight into patients' experiences of LOC, binge eating, and eating-related psychopathology both presurgery and across time.^{9,11,12,14} Measuring problematic eating using semi-structured diagnostic interviews would advance this literature, which has largely relied on self-report questionnaires. While research with adults who underwent bariatric surgery has measured problematic eating using semi-structured diagnostic interviews,¹⁵ which is recommended as a more rigorous assessment method for this population than questionnaires,¹⁶ no studies have incorporated such measurement among young adults who underwent surgery while also examining associations with novel psychosocial factors.

Utilizing a prospective observational design, we aimed to examine relevant problematic eating behaviors (i.e., objective binge eating,

objective overeating, and grazing) and eating-related psychopathology (e.g., eating restraint and eating/weight/shape concerns) that may adversely impact health outcomes^{9,14,17} in a sample of young adults (ages 19–24) in the United States who had bariatric surgery as adolescents (aged 13–18). A comparator group who did not undergo surgery provide critical developmental context regarding the psychosocial trajectory of adolescents with severe obesity as they transition to young adulthood. This study aimed at (Aim 1) describing and comparing problematic eating behaviors and eating-related psychopathology at presurgery/baseline and Year 6 postsurgery/follow-up. We hypothesized that groups would have similar rates of problematic eating behaviors and eating-related psychopathology at presurgery/baseline, and that the surgical group would have lower rates at Year 6. Additionally, we described Year 6 eating behaviors unique to patients undergoing surgery and those that are historically low frequency (e.g., vomiting). Within surgical and nonsurgical groups, we examined (Aim 2) concurrent correlates and (Aim 3) presurgery/baseline predictors of Year 6 eating-related psychopathology, including internalizing symptoms, self-worth, weight-related teasing, and weight-related quality of life (WRQOL). For Aims 2 and 3, increased internalizing symptoms, decreased self-worth, increased weight-related teasing, and poorer WRQOL were hypothesized to be associated with increased eating-related psychopathology. Finally, we examined (Aim 4) concurrent associations between problematic eating behaviors, eating-related psychopathology, and percent weight change at Year 6. We hypothesized that increased problematic eating behaviors and eating-related psychopathology at Year 6 would be associated with lower percent weight loss (surgical) and higher percent weight gain (nonsurgical).

2 | MATERIALS and METHODS

2.1 | Design and participants

VIEWpoint is a 6-year follow-up study within TeenVIEW, a prospective observational study series observing adolescents with severe obesity into young adulthood who either underwent bariatric surgery (e.g., surgical group) or presented for nonsurgical lifestyle modification programs (e.g., nonsurgical group). TeenVIEW was not designed as a comparative intervention trial as its parent study, Teen-LABS (NCT00474318), is conducting first generation safety and efficacy observation of adolescent bariatric surgery outcomes. As such, TeenVIEW added a comparator group and aimed to illuminate psychosocial benefits and risks associated with adolescent bariatric surgery relative to a more “natural course” for adolescent severe obesity similar to an approach taken by the AMOS Study¹⁴ conducted during the same time period. As an ancillary study to Teen-LABS study ($N = 242$, recruitment

age 13 to ≤ 19 years),⁸ adolescents were either a subgroup of Teen-LABS participants enrolled within 30 days prior to surgery or a group of demographically similar (i.e., sex, race, and ± 6 months in age) adolescents with severe obesity in nonsurgical lifestyle modification programs across the five Teen-LABS sites in the United States. Initial eligibility criteria and enrollment procedures have been previously reported.^{8,18}

Consistent with national bariatric surgery trends,¹⁹ Teen-LABS adolescents self-identified predominantly as non-Hispanic white females, with fewer teens identifying with other racial and ethnic groups (e.g., non-Hispanic Black). Efforts were made to match nonsurgical to surgical adolescents by race and ethnicity. While groups were statistically similar when comparing non-Hispanic white to all other racial and ethnic groups (Table 1), they differed when examining racial and ethnic groups separately.

At presurgery/baseline, participants included 222 adolescent-caregiver dyads (surgical $n = 139$; nonsurgical $n = 83$). At Year 6 postsurgery/follow-up, 91.4% ($n = 127$) of surgical and 75.9% ($n = 63$) of nonsurgical participants were retained. Reasons for Year 6 nonparticipation included: unable to locate (surgical $n = 9$, nonsurgical $n = 16$), deceased (surgical $n = 1$, nonsurgical $n = 1$), no consent for future research (surgical $n = 1$, nonsurgical $n = 1$), and nonsurgical participants had bariatric surgery ($n = 2$). Institution Review Boards at each site approved Teen-LABS and VIEWpoint study protocols.

2.2 | Procedures

Written assent/consent was obtained at each time point. At presurgery/baseline, research personnel measured heights/weights and administered paper/pencil questionnaires to adolescents in person at Teen-LABS sites. At Year 6, young adults completed self-report questionnaires via a secure web-based portal onsite or at home and structured clinical interviews via phone with a trained clinician. For surgical participants, height/weight were either measured on-site during their Teen-LABS visit ($n = 92$), by trained field examiners at home visits ($n = 29$), or via self-report ($n = 7$).⁸ Height/weight for nonsurgical participants was measured at a Quest Diagnostics™ location closest to their home ($n = 50$) or via self-report ($n = 13$).

2.3 | Measures

2.3.1 | 6-Year outcomes

Eating Disorder Examination-Bariatric Surgery Version

The Eating Disorder Examination-Bariatric Surgery Version (EDE-BSV)¹⁵ was adapted from the EDE, a well-established semi-structured clinical interview used to assess eating-related behaviors and cognitions and diagnose eating disorders.²⁰ The present study assessed

TABLE 1 Participant characteristics

	Surgical M \pm SD % (n)	Nonsurgical M \pm SD % (n)	p
Adolescent characteristics (baseline)	$n = 139$	$n = 83$	
Sex (%female)	79.9% (111)	81.9% (68)	0.71
Race and ethnicity (non-Hispanic white vs. other)			0.08
Non-Hispanic White	66.2% (92)	54.2% (45)	
Non-Hispanic Black	18.0% (25)	39.8% (33)	
Non-Hispanic Biracial	8.6% (12)	-	
Hispanic	7.2% (10)	6.0% (5)	.
Age	16.9 \pm 1.4	16.1 \pm 1.4	<0.001
BMI	51.6 \pm 8.4	46.8 \pm 6.1	<0.001
Surgical procedure			
Roux-en Y gastric bypass	61.9% (86)	-	
Sleeve gastrectomy	36.0% (50)	-	
Adjustable gastric band	2.2% (3)	-	
Young adult characteristics (Year 6)	$n = 127$	$n = 63$	
Age	23.0 \pm 1.4	22.4 \pm 1.4	0.004
BMI	39.7 \pm 11.4	52.6 \pm 11.3	<0.001
Percent weight change (baseline to Year 6) ^a	-22.3 \pm 16.9	14.0 \pm 21.3	<0.001
In school or working	82.6% (100)	79.4% (50)	0.59

^aPercent Weight Change = ((Year 6 weight-presurgery weight)/presurgery weight) \times 100, with positive values indicating weight gain and negative values weight loss.

objective bulimic episodes (eating an objectively large amount of food in one sitting with LOC, hereafter referred to as objective binge eating), *objective overeating* (objective binge eating but without LOC), and *grazing* (i.e., picking/nibbling/eating in an unplanned, repetitious way between meals and snacks). Eating-related psychopathology was measured with a global score²⁰ of eating restraint behaviors and cognitions (i.e., eating, weight, and shape concerns), with higher scores indicating greater eating-related psychopathology.

When assessing certain eating behaviors (e.g., vomiting), the EDE-BSV differentiates between engaging in these behaviors to influence weight or shape, avoid surgery-related physical consequences, and/or adhere to a dietician's recommendations postsurgery. Only eating restraint intended to influence weight or shape contributes to the global score. For the surgical group, eating-related consequences associated with anatomical changes postsurgery were assessed including *plugging* (i.e., food becoming stuck in the small stomach opening), and *dumping* (i.e., weakness, nausea, and diarrhea from certain foods moving too quickly from the stomach to the small intestine).^{15,17}

BMI and percent weight change

Heights and weights were measured at presurgery/baseline and Year 6. Weights were coded as missing for participants reporting current pregnancy at Year 6 ($n = 7$). BMI [kg/m^2] was calculated as well as percent weight change from presurgery to Year 6 ($[\text{year 6 weight} - \text{presurgery weight}] / \text{presurgery weight} \times 100$, with positive values indicating weight gain and negative values weight loss).

2.3.2 | Predictors and correlates

Questionnaire on Eating and Weight Patterns-Revised

The Questionnaire on Eating and Weight Patterns-Revised (QEWP-R) is a self-report measure of problematic eating behaviors²¹ with adequate reliability and validity²² administered at baseline/presurgery and Year 6 (surgical group only). Because the EDE-BSV was only administered at Year 6, the QEWP-R captured baseline problematic eating behaviors (i.e., objective binge eating, objective overeating, and grazing) that align with the EDE-BSV.^{15,20} Objective binge eating was defined as eating an unusually large amount of food *with* LOC at least 1 day a week.^{9,10} Objective overeating was defined as eating a large amount of food *without* LOC at least once per week. Participant responses were Yes/No for *grazing* ("Have you had times when you eat continuously during the day or parts of the day without planning what and how much you eat?").

Internalizing symptoms

The Youth Self-Report²³ Internalizing subscale assessed depression and anxiety symptoms at presurgery/baseline. It has good psychometric properties, and higher T-scores indicate greater symptomology.²³ At Year 6, internalizing symptoms were assessed using the Structured Clinical Interview for DSM-IV-TR,²⁴ a widely used semi-structured, diagnostic interview of psychiatric disorders. Meeting

diagnostic criteria for at least one anxiety and/or depressive disorder was coded as 1 and not meeting criteria for as 0.

Self-worth

Global self-worth, or how happy an individual feels with themselves and their life, was assessed at baseline using Harter's Self-Perception Profile for Adolescents²⁵ and at Year 6 using the college student version.²⁶ This measure has good psychometric properties,^{25,26} and higher scores indicate greater self-worth.

Weight-related Quality of Life

The impact of weight on quality of life was used to assess Weight-related Quality of Life (WRQOL) at baseline (Kids version)²⁷ and at Year 6 (*Lite* version).²⁸ Total raw scores were transformed (0–100 scale) with higher scores indicating better WRQOL. These measures have strong psychometric properties.^{27,28}

Weight-related teasing

At presurgery/baseline, frequency of self-reported weight-related teasing was assessed using the perception of teasing scale, which has good reliability and validity.²⁹ Items were summed and higher scores indicated greater frequency of weight-related teasing.

2.4 | Statistical analyses

Analyses were conducted in SPSS 26 (descriptive statistics and correlations) and Mplus 8.1 (ANCOVAs and regressions). Missing data were handled using maximum likelihood estimation and analyses controlled for participant nesting within the five enrollment sites. All regressions also controlled for personal characteristics including age, race/ethnicity, Year 6 BMI, and sex assigned at birth. Race and ethnicity were transformed for analyses using weighted effects coding,³⁰ which is ideal for variables with unequal observations within each group and allows for comparison of each group to the sample mean rather than an arbitrary reference group (e.g., dummy coding).³⁰ A preliminary correlation analysis between Year 6 QEWP-R and EDE-BSV indicated that endorsing objective binge eating, objective overeating, or grazing on the QEWP-R was significantly correlated with eating-related psychopathology (EDE-BSV global score; $r = 0.43$, $p < 0.001$), thus providing sufficient support to use QEWP-R to control for baseline eating behaviors (0 = none, 1 = any) in models predicting current eating-related psychopathology.

For Aim 1, frequencies of baseline/presurgery (QEWP-R) and Year 6 (EDE) eating behaviors (objective binge eating, objective overeating, and grazing) were calculated. Logistic regressions and an ANCOVA were used to compare groups' (surgical vs. nonsurgical) problematic eating behaviors and eating-related psychopathology. Descriptive analyses assessed Year 6 engagement in historically low frequency eating-related behaviors (e.g., vomiting) and behaviors unique to bariatric surgery patients on the EDE-BSV. For Aims 2–4, a series of regressions were conducted with key demographic factors and baseline problematic eating behaviors controlled. Given sample

size and the number of IVs to be tested, each IV was analyzed in a separate model with covariates to minimize Type II error. These models included concurrent associations of Year 6 psychosocial factors (Aim 2: internalizing symptoms, self-worth, WRQOL) and presurgery/baseline psychosocial predictors (Aim 3: internalizing symptoms, self-worth, weight-related teasing, and WRQOL) with eating-related psychopathology at Year 6 within each group. Finally, concurrent associations between Year 6 problematic eating behaviors (i.e., objective binge eating, objective overeating episodes, grazing, and eating-related psychopathology) and percent weight change were examined using a series of regression analyses. Because problematic eating behaviors, as measured by the EDE-BSV, are not mutually exclusive (e.g., participants can have both subjective and objective binge eating) and often co-occur, separate regression models were conducted for each eating predictor to avoid multicollinearity concerns.

3 | RESULTS

3.1 | Participant characteristics

Participant characteristics are reported in Table 1. Participants were 13–18 years old at pre-surgery/baseline and 19–24 years old at Year 6. On average at Year 6, surgical participants lost 22.3% of their

presurgery weight and had significantly lower BMIs ($p < 0.001$) than nonsurgical participants who weighed 14% more than baseline.

3.2 | Young adult eating and weight change

Separate regressions were conducted to examine concurrent (Year 6) associations of problematic eating behaviors and eating-related psychopathology with weight change outcomes while controlling for covariates (see Table 2). For the surgical group, eating-related psychopathology, objective overeating, and objective binge eating were associated with lower percent weight loss (p 's < 0.001). For the nonsurgical group, eating-related psychopathology was associated with higher percent weight gain ($p < 0.001$).

3.3 | Problematic eating behavior prevalence and group differences

Figure 1 presents descriptive data for problematic eating behaviors at pre-surgery/baseline and Year 6 for both groups. At presurgery/baseline, the surgical group had significantly higher objective binge eating (29.7%, $n = 41$) rates compared to the nonsurgical group (10.8%, $n = 9$, $p = 0.02$). At Year 6, the surgical group reported lower eating-related psychopathology ($M = 0.98$, $SD = 0.76$) and lower

TABLE 2 Concurrent associations between year 6 problematic eating behaviors and percent weight change

	Surgical ($n = 139$)			Nonsurgical ($n = 83$)		
	<i>B</i>	95% CI for <i>B</i>	<i>p</i>	<i>B</i>	95% CI for <i>B</i>	<i>p</i>
Covariates ^a						
Sex ^b	3.74	[1.03, 6.46]	0.01	1.02	[-7.43, 9.48]	0.81
Non-Hispanic white ^c	1.08	[-1.37, 3.52]	0.39	-0.07	[-5.30, 5.17]	0.98
Non-Hispanic Black	-4.41	[-12.71, 3.89]	0.30	1.62	[-6.08, 9.31]	0.68
Non-Hispanic Biracial	0.95	[-2.27, 4.18]	0.56	-	-	-
Hispanic	-0.02	[-3.81, 3.77]	0.99	-10.09	[-35.43, 15.25]	0.44
Age	-0.70	[-1.67, 0.27]	0.16	-1.70	[-3.58, 0.18]	0.08
BMI (Year 6)	1.15	[0.87, 1.42]	<0.001	1.57	[1.25, 1.88]	<0.001
Baseline disordered eating	-1.34	[-3.34, 0.66]	0.19	-0.06	[-5.04, 4.92]	0.98
Eating behaviors (EDE-BSV) ^d						
Global EDE	2.68	[1.34, 4.03]	<0.001	3.14	[1.86, 4.14]	<0.001
OBE	16.53	[13.36, 19.70]	<0.001	3.45	[-2.47, 9.37]	0.25
OOE	9.09	[5.20, 12.98]	<0.001	-3.44	[-11.76, 4.88]	0.42
Grazing	2.14	[-3.13, 7.42]	0.43	3.10	[-0.50, 6.69]	0.09

^aCovariate values were generated in a model with only covariates and the outcome variable (percent weight change).

^bScoring was male = 0, female = 1.

^cRace and Ethnicity group mean compared to sample mean (no reference group).

^dEach independent variable was tested in a separate model with covariates.

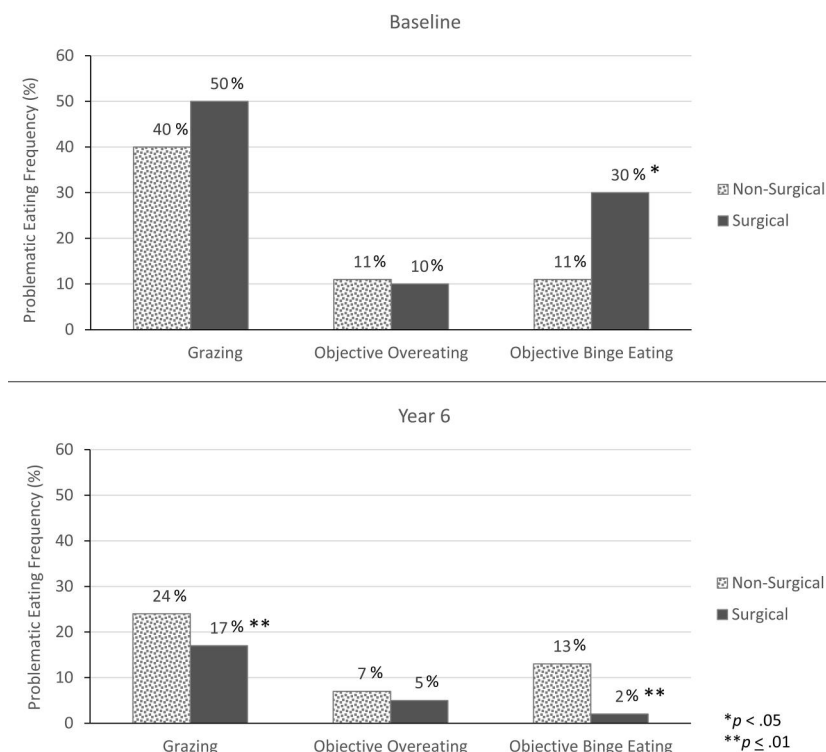


FIGURE 1 Differences in problematic eating behaviors between surgical and nonsurgical groups at baseline and Year 6

prevalence of objective binge eating (1.7%, $n = 2$) and grazing (17.4%, $n = 20$) than the nonsurgical group ($M = 1.24$, $SD = 0.72$; 12.9%, $n = 8$; 24.2%, $n = 15$; $p \leq 0.01$). Additional Year 6 eating behavior characteristics, including those unique to patients undergoing bariatric surgery, are presented in Table 3. Chewing and spitting out, rumination, and vomiting for weight- and shape-related reasons were very low (<1%–2%). More common were plugging, dumping, and vomiting for non-weight- and shape-related reasons.

3.4 | Concurrent associations with young adult eating-related psychopathology

Concurrent associations between psychosocial variables (i.e., internalizing symptoms, self-worth, and WRQOL) and eating-related psychopathology were examined at Year 6 (see Table 4). While controlling for covariates and baseline problematic eating behaviors, lower WRQOL and global self-worth were associated with higher eating-related psychopathology for the surgical and nonsurgical groups ($p < 0.001$).

3.5 | Predictive associations of young adult eating-related psychopathology

The associations between pre-surgery/baseline psychosocial factors (internalizing symptoms, self-worth, weight-related teasing, and WRQOL) and eating-related psychopathology at Year 6 were examined. For the surgical group, lower self-worth ($p < 0.001$),

greater internalizing symptoms ($p = 0.03$), and higher weight-related teasing ($p = 0.04$) predicted increased eating-related psychopathology at Year 6 ($p < 0.001$) after controlling for covariates (see Table 4). For the nonsurgical group, no significant baseline psychosocial factors were identified.

4 | DISCUSSION

The present study is the first to examine problematic eating behaviors, eating-related psychopathology, and associated psychosocial factors across time among both surgical and nonsurgical treatment-seeking youth with severe obesity. As expected, young adults in the nonsurgical group reported greater Year 6 objective binge eating, grazing, and eating-related psychopathology than those who had bariatric surgery. Previous research has shown improvement in problematic eating behaviors following surgery,^{9,14} and while not designed as a comparative trial, the present findings highlight potential benefits associated with adolescent bariatric surgery in the context of a more “natural course” for severe obesity among peers who did not undergo surgery.

While anatomical changes (e.g., reduced stomach capacity) from bariatric surgery likely impact problematic eating behaviors and contribute to group differences, eating-related psychopathology differences are less likely to be an artifact of anatomical differences given that the EDE-BSV explicitly excludes surgery-motivated eating behaviors (e.g., restrictive eating to avoid plugging) from the score. Additionally, this study is the first to describe bariatric surgery-motivated eating behaviors among young adults. Future research should explore the function (e.g., adaptive vs. pathological) and impact

TABLE 3 Prevalence of unique EDE-BSV eating behaviors

	Surgical		Nonsurgical	
	n (%)	Total n	n (%)	Total n
<i>Discrete eating behaviors (do not contribute to scale scores)</i>				
Plugging	10 (8.8)	113	-	
Dumping	20 (17.9)	112	-	
Vomiting – weight and shape related	1 (0.9)	115	0	62
Vomiting – Not weight and shape related ^a	14 (12.4)	113	-	
To avoid physical discomfort	7 (50.0)	14	-	
To avoid plugging	4 (28.6)	14	-	
To avoid dumping	3 (21.4)	14	-	
Other	2 (14.3)	14	-	
Chewing and spitting out – Weight and shape related	1 (0.9)	115	2 (3.2)	62
Chewing and spitting out – not weight and shape related ^b	1 (0.9)	113	-	
Rumination – weight and shape related	0	115	0	62
Rumination – not weight and shape related ^b	1 (0.9)	113	-	
<i>Eating restraint subscale items^c</i>				
<i>Eating restraint – Consciously restrict amount eaten</i>				
To influence shape or weight, or avoid triggering overeating episode	41 (35.7)	115	31 (50)	62
To avoid physical discomfort	5 (4.4)	113	-	
To avoid plugging	2 (1.8)	113	-	
To avoid vomiting	2 (1.8)	113	-	
Other	1 (0.9)	113	-	
<i>Eating avoidance – Intentionally avoid eating for ≥8 h</i>				
To influence shape or weight, or avoid triggering overeating episode	6 (5.2)	115	2 (3.2)	62
To avoid physical discomfort	1 (0.9)	113	-	
To avoid plugging	1 (0.9)	113	-	
To avoid vomiting	2 (1.8)	113	-	
Other	3 (2.7)	113	-	
<i>Empty stomach – Desire for stomach to be empty</i>				
To influence weight or shape	3 (2.7)	115	4 (6.5)	62
To avoid physical discomfort	6 (5.3)	113	-	
To avoid plugging	3 (2.7)	113	-	
To avoid vomiting	2 (1.8)	113	-	
Other	1 (0.9)	113	-	
<i>Food avoidance – Exclude certain foods from diet that one enjoys</i>				
To influence shape or weight, or avoid triggering overeating episode	22 (19.1)	115	20 (32.3)	62
To adhere to dietician	1 (0.9)	113	-	
To avoid physical discomfort	4 (3.5)	113	-	
To avoid plugging	2 (1.8)	112	-	
To avoid vomiting	0	113	-	
To avoid dumping	1 (0.9)	113	-	
Other	2 (1.8)	113	-	

(Continues)

TABLE 3 (Continued)

	Surgical		Nonsurgical	
	n (%)	Total n	n (%)	Total n
<i>Dietary rules – Self-imposed dietary rules</i>				
To influence weight or shape	10 (8.7)	115	11 (17.7)	62
To adhere to dietician	2 (1.8)	112	–	
To avoid physical discomfort	2 (1.8)	112	–	
To avoid plugging	0	111	–	
To avoid vomiting	1 (0.9)	112	–	
To avoid dumping	2 (1.8)	112	–	
Other	2 (1.8)	112	–	

^aReasons for engaging in nonweight-related vomiting are not mutually exclusive.

^bReason for engaging in behavior was “other”.

^cOnly restraint behaviors done to influence weight, shape, or avoid triggering overeating are used to calculate the Restraint subscale score and EDE-BSV Global Score.

TABLE 4 Eating-related psychopathology at Year 6: baseline predictors and concurrent associations

	Surgical (n = 139)			Nonsurgical (n = 83)		
	B	95% CI for B	p	B	95% CI for B	p
<i>Covariates^a</i>						
Sex ^b	0.50	[0.18, 0.82]	0.002	0.09	[−0.25, 0.43]	0.59
Non-Hispanic white ^c	0.04	[0.01, 0.07]	0.02	0.07	[0.01, 0.14]	0.07
Non-Hispanic Black	−0.09	[−0.21, 0.04]	0.17	−0.11	[−0.26, 0.05]	0.17
Non-Hispanic Biracial	−0.02	[−0.13, 0.09]	0.76	–	–	–
Hispanic	−0.10	[−0.29, 0.08]	0.29	0.11	[−0.81, 1.04]	0.81
Age	0.08	[0.003, 0.15]	0.04	0.06	[−0.02, 0.14]	0.16
BMI (Year 6)	0.01	[−0.01, 0.02]	0.27	0.01	[−0.01, 0.02]	0.27
Baseline eating	0.11	[−0.23, 0.46]	0.52	0.33	[0.06, 0.60]	0.02
<i>Concurrent factors^d</i>						
Internalizing diagnosis	0.26	[−0.06, 0.58]	0.11	0.36	[−0.04, 0.76]	0.08
Weight-related QOL	−0.02	[−0.02, −0.01]	<0.001	−0.02	[−0.02, −0.01]	<0.001
Self-worth	−0.41	[−0.47, −0.35]	<0.001	−0.41	[−0.54, −0.28]	<0.001
<i>Baseline predictors^d</i>						
Internalizing diagnosis	0.01	[0.001, 0.02]	0.03	0.004	[−0.003, 0.01]	0.28
Weight-related QOL	−0.003	[−0.01, 0.00]	0.07	0.002	[−0.01, 0.01]	0.67
Self-worth	−0.32	[−0.40, −0.25]	<0.001	−0.16	[−0.45, 0.14]	0.29
Weight-related teasing	0.01	[0.001, 0.03]	0.04	−0.03	[−0.06, 0.01]	0.14

^aCovariate values were generated in a model with only covariates and the outcome variable (EDE-BSV global).

^bScoring was male = 0, female = 1.

^cRace and Ethnicity group mean compared to sample mean (no reference group).

^dEach independent variable was tested in a separate model with covariates.

of these behaviors and ensure that assessment is appropriately tailored and accurately estimating symptomology for this unique group.³¹

Although concurrent associations between psychosocial factors and eating-related psychopathology in young adulthood yielded congruent trends across groups, differences emerged in predictive

relationships from adolescence to young adulthood. Only baseline problematic eating behavior was a significant predictor for the nonsurgical group, which signals persistence of eating behavior and related psychopathology. In the surgical group, increased mental health concerns, poorer self-worth, and greater weight-related teasing during adolescence were associated with increased eating-related psychopathology in young adulthood.

These psychosocial findings are consistent with previous research with weight diverse populations, which highlighted that adolescent depressive symptoms,² decreased self-esteem,² and weight-related teasing³² predicted problematic eating behaviors into young adulthood. Despite differences in how problematic eating was measured, present findings also align with Teen-LABS/TeenVIEW and AMOS studies, which highlighted concurrent (presurgery, 2 years postsurgery) and prospective associations (presurgery, 2 years postsurgery) of increased LOC/binge eating with increased depressive symptoms,¹⁰ increased broad psychopathology³³ and mental health concerns,³⁴ and poorer WRQOL.¹⁰ Present findings also introduce novel associations for this population, namely those between weight-related teasing, self-esteem, and eating-related psychopathology. While future research is needed to test predictive models with these factors, current findings suggest that both groups of young adults could benefit from clinical intervention related to problematic eating and associated psychosocial concerns. Although the transition to adult healthcare and its associated barriers³⁵ may complicate access to such intervention, it is critical to identify developmentally sensitive mental and behavioral health resources in young adulthood.

At Year 6, problematic eating behaviors and related psychopathology were associated with weight change among both groups such that young adults who had bariatric surgery experienced poorer weight loss and those with persistently severe obesity experienced greater weight gain. Consistent with previous work,^{3,9,14} these findings suggest that problematic eating may attenuate young adult postsurgical outcomes, further contributing to health concerns. For nonsurgical young adults, who on average gained weight from baseline to Year 6 (14% increase), these findings highlight the potential for problematic eating to exacerbate this trend. Given the cross-sectional nature of these associations in the present study, future work should examine these relationships prospectively, using similarly robust measures of problematic eating.

Our study has several strengths. First, the present study incorporated a nonsurgical group, providing both context to understanding problematic eating following bariatric surgery as well as additional information on problematic eating in an understudied group with persistently severe obesity from adolescence into young adulthood. While our findings provide a glimpse into their eating behaviors, future work is needed to understand their unique experiences. Data collection also spanned from adolescence to young adulthood, thus providing insight on eating behaviors during a pivotal developmental period. Additionally, problematic eating behaviors and eating-related psychopathology were measured using a semi-structured, clinical interview (EDE-BSV).

While this study presents several novel findings, its limitations are also important to review. The study's nonrandomized design limits our ability to directly compare groups and attribute any differences to surgical status. The AMOS Study's work¹⁶ used a similar approach with adolescents in Sweden. Additionally, although the EDE is well-established, the EDE-BSV has not been validated for young adult, bariatric surgery populations. While telephone-based EDE administration has not been validated against face-to-face administration, it has shown greater diagnostic concordance with self-report EDE-Q,³⁶ possibly related to increased anonymity and associated willingness to disclose stigmatizing eating pathology. Additionally, LOC and weight outcome trends have been examined at several time points through Year 4 follow-up in our surgical group,⁹ but the present study examined eating and weight change only from baseline to Year 6 since the nonsurgical group received the QEWP-R only through Year 2 follow-up and the EDE-BSV was first administered at Year 6. Future work will examine EDE-BSV trends and weight change across later follow-up time points. Regarding the study sample, participants predominantly identified as non-Hispanic white females, and our findings may not reflect the experiences of participants with diverse racial, ethnic, and gender identities. Importantly, our sample reflects a systemic disparity in pediatric bariatric surgery in the United States in which patient populations are predominantly non-Hispanic white females¹⁹ while severe obesity systematically affects those who identify as non-Hispanic Black and Hispanic⁷ due to complex social determinants and inequities.³⁷ Future research work is necessary to represent young adults with diverse racial, ethnic, and gender identities and understand their surgical experiences.

In conclusion, young adults who had adolescent bariatric surgery reported higher problematic eating than nonsurgical peers during adolescence but reported lower engagement in young adulthood. For those who had bariatric surgery, poorer presurgical psychosocial functioning was associated with problematic eating 6 years postsurgery, which was concurrently associated with lower percent weight loss. Undergoing bariatric surgery during adolescence appears to afford benefit for problematic eating and eating-related psychopathology. As problematic eating may detrimentally impact treatment benefit, continued assessment and treatment is important throughout postoperative life.

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CONFLICT OF INTEREST

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AUTHOR CONTRIBUTIONS

All authors contributed to interpretation of data, critical review and revision of the article for important intellectual content, and approved the final version. The following authors have made additional specific contributions. Kristina M. Decker, Jennifer Reiter-Purtill, and Meg H. Zeller have verified the underlying data and conceptualized and designed the study, conducted statistical analyses, and written the manuscript. Carolina M. Bejarano also contributed to manuscript writing. Andrea B. Goldschmidt and James E. Mitchell contributed to study conceptualization and design. Todd M. Jenkins contributed to study design and study oversight. Meg H. Zeller conceptualized and designed the TeenView series, coordinated and oversaw data collection.

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