Published in final edited form as:

Clin Obes. 2017 December ; 7(6): 384–392. doi:10.1111/cob.12211.

Who Seeks Bariatric Surgery? Psychosocial Functioning Among Adolescent Candidates, Other Treatment-Seeking Adolescents with Obesity, and Healthy Controls

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Abstract

Limited data are available on the characteristics of adolescents with obesity who seek bariatric surgery. Existing data suggest that adolescent surgery candidates have a higher body mass index (BMI) than comparison adolescents with obesity, but the limited findings regarding psychosocial functioning are mixed. This study aimed to compare BMI and psychosocial functioning among adolescent bariatric surgery candidates, outpatient medical-treatment-seeking adolescents with obesity (receiving lifestyle modification), and adolescents in the normal-weight range. All adolescents completed self-report measures of impulsivity, delay discounting, depression, anxiety, stress, eating pathology, family functioning, and quality of life, and had their height and weight measured. Adolescent surgical candidates had higher BMIs than both comparison groups. Surgical candidates did not differ from medical-treatment-seeking adolescents with obesity on any measure of psychosocial functioning, but both groups of adolescents with obesity reported greater anxiety and eating pathology and poorer quality of life than normal-weight adolescents. Quality of life no longer differed across groups after controlling for BMI, suggesting that it is highly related to weight status. Adolescents with obesity may experience greater anxiety, eating pathology, and quality of life impairments than their peers in the normal-weight range regardless of whether they

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Conflict of Interest:

The authors declare that they have no conflicts of interest.

are seeking surgery or outpatient medical treatment. Clinical implications and directions for future research are discussed.

Keywords

Bariatric Surgery; Adolescents; Psychosocial Functioning; Eating Pathology; Anxiety

Introduction

Among children ages 2–19 in the United States, recent data indicate that overall rates of overweight and obesity have stabilized; however, the proportion of youth affected by excess weight remains notable with more than 30% meeting criteria for overweight and approximately 17% meeting criteria for obesity (1, 2). Additionally, the prevalence of severe obesity (e.g., body mass index [BMI] equal to or greater than 120% above the 95th percentile (3)), may be on the rise in US children and adolescents (2). Obesity in youth is associated with significant medical and psychological consequences (e.g., glucose metabolism, nonalcoholic fatty liver disease, impaired quality of life), making effective treatment imperative (4).

A growing research literature suggests that bariatric surgery is a safe and useful weight loss treatment for adolescents with severe obesity (5–7). Although the number of adolescents receiving bariatric procedures has increased over the past 20 years (8), limited data are available on the psychosocial differences between youth with obesity seeking surgical versus behavioral treatments. Understanding the potentially unique psychosocial characteristics of adolescents seeking bariatric surgery is crucial as it is currently unclear whether this group requires specialized services or treatments beyond routine medical care for obesity, particularly given that excess weight alone is not a psychiatric condition (3). Although adolescents pursuing bariatric procedures are required to undergo a psychosocial evaluation to receive approval for surgery, little research exists to guide clinicians conducting this evaluation. Additional research on psychosocial functioning in adolescents seeking bariatric surgery has the potential to inform the pre-surgery psychosocial interview (ensuring that clinicians assess for relevant psychosocial factors), intervention tailoring, and future treatment research (3).

Studies from the adult literature have identified clinically relevant differences between individuals with obesity who present for bariatric surgery and those who do not. For example, adult surgical candidates weigh more and report higher levels of emotional distress and disordered eating than non-surgery-seeking adults with obesity (9). Additionally, adult women seeking either behavioral or surgical obesity interventions may have a higher rate of lifetime psychiatric disorders than non-treatment seeking adult women with obesity (10). These differences in psychosocial functioning may have important implications for treatment outcome, making it crucial to assess for their presence in adolescents.

Uncontrolled studies of adolescents seeking bariatric surgery suggest that psychosocial impairments, including depressive symptoms, eating pathology and poor quality of life, are notable in at least a subset of this population (11–13). However, extant data comparing

psychosocial functioning between adolescent bariatric candidates and other adolescent samples have produced mixed findings. In one study, adolescent surgical candidates reported poorer weight-related quality of life than published reference samples of adolescents in the normal-weight to moderately obese ranges (14). However, these surgical candidates did not differ from a published reference sample of adolescents with severe obesity (14). In another study, health-related quality of life was similar in adolescent surgical candidates and adolescents with severe obesity seeking behavioral weight management (15). Alternatively, another study found that adolescent surgical candidates reported *fewer* psychological difficulties than adolescents with severe obesity participating in behavioral weight control programs (16). Thus, it is unclear whether adolescents seeking bariatric surgery demonstrate unique psychosocial characteristics that require specialized assessment and intervention. Data on BMI, although limited, reveal clearer trends: adolescent surgical candidates appear to have higher BMIs than adolescents receiving behavioral weight management (15, 16).

Given potential clinical implications, it is crucial to more thoroughly isolate the characteristics unique to adolescent bariatric surgery candidates. Research suggest that several psychosocial factors, including impulsivity (17, 18), depression (19), anxiety (20), disordered eating (21), poor quality of life (22), and family stressors (23), are implicated in adolescent obesity. These factors may cause, exacerbate, maintain, and/or be a consequence of excess weight. Thus, this study aimed to compare these key psychosocial factors and BMI in adolescent bariatric candidates to two recruited control groups: adolescents seeking outpatient medical treatment for obesity (i.e., lifestyle modification) and adolescents in the normal-weight range.

Based on prior studies, we hypothesized that youth enrolled in a bariatric surgical program would have higher BMIs than both comparison groups and demonstrate greater impairment on self-report assessments of psychosocial functioning than adolescents in the normal-weight range, but report similar functioning to medical-treatment-seeking adolescents with obesity. Based on the expected characteristics of adolescents from these diverse samples, we planned to control for demographic variables that were significantly different between groups to ensure that these background variables were not explaining the entirety of differences in psychosocial functioning. Additionally, to better understand the role of excess weight in psychosocial functioning, we planned to conduct analyses with and without BMI as a covariate. As an exploratory aim intended to better understand adolescent surgical candidates, we also examined differences in psychosocial functioning and BMI between adolescents seeking medical treatment for obesity and adolescents within a normal-weight range.

Materials and Methods

Participants

Participants included three groups of adolescents (see Figure 1): 1) 86 surgical candidates from a specialty adolescent bariatric program in the surgery department of a large urban medical center, 2) 19 adolescents receiving outpatient medical treatment for obesity in the endocrinology department of the same large urban medical center, recruited over the same

period of time, and 3) 28 normal-weight healthy comparison adolescents from the community.

All participants were between the ages of 13–18 and fluent in English. At screening, potential participants from all groups were excluded for a Wechsler Abbreviated Scale of Intelligence (WASI (24)) total score of less than 70. All adolescents and their parent(s) provided written informed assent and consent. This protocol was reviewed and approved by an Institutional Review Board.

Adolescent surgical candidates were considering either a laparoscopic adjustable gastric band (LAGB) or a gastric sleeve resection. As LAGB is not approved for use with minors by the Food and Drug Administration (FDA), adolescents receiving this procedure were participating in a study conducted as part of an FDA Investigational Device Exemption and/or already 18 years of age at the time of surgery. All adolescent surgical candidates also met the following criteria: 1) BMI $>40 \text{ kg/m}^2$ or $>35 \text{ kg/m}^2$ with serious medical complications (e.g., type II diabetes); 2) history of obesity for at least five years with one or more years of unsuccessful weight loss through nutritional and medical management; 3) consistent participation in a pre-surgery program for at least 6 months, including meeting with surgical, medical, and nutrition staff; 4) for female candidates, reliable contraceptive use and no intention of becoming pregnant in the year after surgery; 5) no medical conditions that would exclude surgery; and 6) no current self-induced vomiting. At the time of this study, surgical candidates were enrolled in the bariatric program and intended to undergo surgery, but were not necessarily approved for surgery.

Adolescents receiving outpatient medical treatment were provided with initial medical, psychosocial, and nutritional evaluations followed by lifestyle modification for obesity. To receive lifestyle modification, adolescents were required to have a BMI at or above the 95th percentile for age and height.

Adolescents in the normal-weight comparison group were required to have a BMI between the 25th and 85th percentile for sex and age.

Procedure

Participants in all groups completed self-report assessments of psychosocial functioning and demographic information, including age, gender, race, and household socioeconomic status (SES; measured by the Four Factor Index of Social Status (25)). Height and weight were measured by trained research staff.

Assessments

Participants completed the following self-report assessments:

The Barratt Impulsiveness Scale-11-Adolescent Version (BIS-11-A)—The BIS-11-A, adapted from the adult version (BIS-11 (26)), has demonstrated good reliability and validity in youth, particularly with the total scale score (27). This 30-item scale measures impulsivity, with higher scores corresponding to greater impulsivity.

Delay Discounting: Monetary Choice Questionnaire (MCQ)—The MCQ examines delay-discounting, an index of impulsive choices, by asking participants to decide between pairs of real monetary rewards (28). For each of the 27 choices, participants pick either a smaller immediate monetary reward or a larger delayed monetary reward (e.g., “Would you prefer \$31 today, or \$85 in 7 days?”) Choice patterns allow for the calculation of the participant’s discount rate, k , or the rate at which the participant reduces the value of the future reward based on length of delay. A steeper discount rate, when the participant reduces the reward more rapidly with increases in delay, suggests a higher level of impulsivity. The MCQ has been administered to adolescents in previous studies (29).

Depression Anxiety Stress Scales (DASS)—The DASS is a 42-item measure with three subscales (Depression, Anxiety, Stress) assessed over the past week (30). Higher scores signify more symptoms. In prior research, the DASS showed good reliability and validity (31), and has been used with adolescents with eating and weight problems (22).

Eating Disorders Examination-Questionnaire (EDE-Q)—The EDE-Q is a 38-item measure of eating pathology over the previous 28 days (32). In addition to obtaining frequency of disordered behaviors (e.g., binge eating), the questionnaire generates four subscales (Restraint, Eating Concern, Shape Concern, and Weight Concern) and a global score. Higher scores denote greater eating pathology. The EDE-Q, which has been used to study adolescents with overweight BMIs, consistently demonstrates adequate reliability and validity (33).

Pediatric Quality of Life Inventory (PedsQL)—The PedsQL is a reliable and valid (34) 23-item self-report measure that gauges health-related quality of life in adolescents (35). The total standardized score ranges from 0–100, with higher scores indicating better quality of life.

Family Assessment Device (FAD)—The FAD includes a 12-item General Functioning subscale, with higher scores representing greater family dysfunction (36). The FAD has shown adequate reliability and validity across several studies (37).

Statistical Analysis

Data were analyzed using IBM SPSS Statistics Version 24 (IBM Corporation, Armonk, New York). Significance levels were set at $\alpha=0.05$. Within each group (bariatric surgery candidates, adolescents receiving medical treatment for obesity, normal-weight adolescents), frequencies, means, and standard deviations (as indicated) were calculated for demographic variables, BMI, and self-report measures. The Four Factor Index of Social Status (25) was scaled from 8 (lowest status) to 66 (highest status) to obtain household SES. Demographic information (age, race, gender, and SES) and BMI were compared across groups. When demographic characteristics were significantly different across groups, which was expected based on the typical populations enrolled in this study, we controlled for demographic variables to isolate the relationship of interest without a potential confound (38). We ran analyses with and without BMI as a covariate in order to better understand whether any psychosocial differences were purely a function of increased weight alone. For continuous

data, analyses of variance (ANOVAs) or, where assumptions of homogeneity of variance were violated, Brown-Forsyth tests were conducted. Post-hoc Tukey HSD and Games-Howell tests were utilized when the omnibus test was significant. Chi-square (χ^2) tests analyzed categorical data. To examine whether groups differed on psychosocial functioning, multivariate linear regressions were conducted. Categorical variables were dummy coded and rotated to make comparisons between all possible pairs of groups (i.e., bariatric surgery candidates vs. medical-treatment-seeking adolescents with obesity; bariatric surgery candidates vs. adolescents in the normal-weight range; medical-treatment-seeking adolescents with obesity vs. adolescents in the normal weight range). One regression analysis was run for each dependent variable, controlling for demographic differences as described below.

Assumptions of normality were tested at the univariate and multivariate levels, and BMI, the BIS-11-A, DASS Anxiety and Depression scales, EDE-Q subscales and global score, and MCQ were positively skewed for one or more group(s). To correct skewness, log or square root transformations were applied. Analyses were run with and without outliers, which were identified on the BIS-11-A, MCQ, and EDE-Q subscales and global score, with no impact on significance. As such, the reported analyses include all cases. Missing data was excluded.

Results

Descriptive Statistics

Summaries of demographic data are presented in Table 1. The overall sample was 51.1% Hispanic ($n=68$), 29.3% Caucasian ($n=39$), 14.3% African American ($n=19$), 1.5% Asian ($n=2$), and 3.8% other ($n=5$), with 32.3% males ($n=43$) and 67.7% females ($n=90$), and a mean age of 15.80 years ($SD=1.34$). Neither age nor sex differed significantly across groups, but analyses revealed significant group differences in the following: racial/ethnic composition, $\chi^2(8, n=133)=31.73, p<0.001$, with medical-treatment-seeking adolescents with obesity differing from both other groups ($p's<.001$); SES, $F(2, 114) = 8.15, p<.001$, with adolescents in the normal-weight range reporting higher household SES than both groups of adolescents with obesity, but no significant differences between the two groups of adolescents ($p's<.05$); and BMI $F(2, 57.28) = 302.46, p<.001$, with all three groups differing significantly, ($p's<.01$). As above, subsequent analyses controlled for race/ethnicity, SES, and (where noted) BMI.

Descriptive data for each of the untransformed psychosocial measures is presented in Table 2. Results from the regression analyses are presented in Table 3. The regression models for impulsivity (BIS-11-A), stress (DASS Stress Subscale), delay discounting (MCQ), and family functioning (FAD) did not reach significance with or without BMI as a covariate, indicating no differences among the three groups (surgical candidates, medical-treatment-seeking adolescents with obesity, normal-weight controls) after controlling for race/ethnicity and SES. The overall regression models for depression (DASS Depression Subscale), anxiety (DASS Anxiety Subscale), eating pathology (EDE Global Score and all subscales), and quality of life (PEDS-QL) were significant regardless of whether BMI was included as a covariate. Examinations of individual predictors (presented in Table 3) revealed that surgical candidates and medical-treatment-seeking adolescents with obesity did not differ

significantly from each other on any measure, with or without BMI as a covariate. However, differences emerged between both groups of adolescents with obesity and normal-weight adolescents. Adolescents with obesity reported significantly greater anxiety and eating pathology and significantly poorer quality of life than the normal-weight comparison group. When controlling for BMI, differences in quality of life between adolescents with obesity and normal-weight adolescents were no longer significant; additionally, differences in eating concern between bariatric candidates and normal-weight adolescents were no longer significant. Medical-treatment-seeking adolescents had significantly higher depression scores than normal-weight adolescents, but this results was also no longer significant when controlling for BMI.

Discussion

This study examined whether adolescents seeking bariatric surgery differed on psychosocial outcomes from adolescents receiving outpatient medical treatment for obesity (i.e., lifestyle modification) and from adolescents in the normal-weight range. As hypothesized, adolescent bariatric surgery candidates had higher BMIs than both comparison groups, although there was overlap in BMI range between surgical candidates and outpatient medical-treatment-seeking adolescents. Impulsivity, stress, delay discounting, and family dysfunction did not differ across the three groups. Additionally, surgical candidates did not differ from other treatment-seeking adolescents on any measure of psychosocial functioning. However, both surgical candidates and medical-treatment-seeking adolescents with obesity reported greater anxiety and eating pathology and poorer quality of life than normal-weight adolescents after controlling for race/ethnicity and SES. Quality of life no longer differed when controlling for BMI, suggesting that this impairment may be a function of higher weight.

Prior research examining psychosocial functioning in adolescent bariatric surgery candidates has not produced clear results. By expanding our comparison samples to include both medical-treatment-seeking adolescents with obesity and normal-weight adolescents, this study extends the limited research in this area. Our finding that adolescent surgical candidates have greater levels of eating pathology, anxiety, and poorer quality of life than normal-weight adolescents is consistent with uncontrolled studies in this population (11–13), and findings from the adult literature (10, 39). Also in line with our results, prior research has noted higher rates of anxiety and eating pathology in *non-surgery-seeking* adolescents with obesity, suggesting that although excess body weight is a medical condition, clinicians should be aware of the potential for specific psychosocial problems to occur in all treatment-seeking youth with obesity (40). Our results are also consistent with prior studies finding that adolescent surgical candidates have higher BMIs (15, 16) but similar quality of life (14, 15) when compared to their peers with moderate to severe obesity. However, we failed to find differences in psychosocial functioning between medical-treatment-seeking adolescents with obesity and surgical candidates, as reported elsewhere (16). This contradictory finding may be due in part to sample characteristics. For example, we examined adolescent bariatric surgery candidates who were pursuing a surgical intervention, but were not yet approved for a procedure; other studies may have captured adolescent surgery candidates at different points in the approval process. The surgery approval process itself may select out

adolescents high in psychosocial impairment (3). Future research could compare bariatric candidates at different points in the surgery approval process.

Despite a number of strengths of our study, some limitations must be noted. Although we recruited both groups of adolescents with obesity from the same large medical center over the same period of time, we achieved a smaller sample of adolescents seeking medical treatment for obesity due to patient flow. We aimed for the number of adolescents within a normal-weight range to approximately match that of our adolescents seeking medical treatment for obesity and, thus, both comparison groups were smaller than our bariatric candidate group. Nonetheless, our effect sizes suggest that adding additional participants would not significantly impact results. Additionally, significant differences in certain demographic variables emerged across groups. Adolescents in the normal-weight range reported significantly higher SES than both groups of adolescents with obesity, which may indicate a bias between the types of adolescents enrolled in this study, even when the samples themselves were representative of the larger population of surgical candidates, medical treatment-seeking, and normal-weight adolescents. Race and ethnicity also differed significantly across groups, with all medical-treatment-seeking adolescents identifying as Hispanic, which may limit the generalizability of our results. Nonetheless, the ethnic composition of the medical-treatment-seeking adolescents reflects the population seen in the specialty clinic of the urban medical center where recruitment occurred, and race/ethnicity was controlled for statistically. Another limitation involves the use of self-report measures, which may be more susceptible to bias. Some of our variables also exhibited floor effects, which suggests that other measures may be more appropriate. Future studies could examine psychosocial factors using additional measures. Finally, this study did not assess for the amount of time spent in the program prior to baseline for surgical candidates or medical-treatment-seeking adolescents. It is possible that the duration of program participation affected psychosocial functioning. For example, functioning may have improved with time in program, or the possibility of receiving effective treatment may have induced hope in participants.

In conclusion, this study provides an important extension to understanding the clinical presentation of adolescents seeking bariatric surgery. Our findings indicate that clinicians should be aware that anxiety, eating pathology, and quality of life impairments may be elevated in this group *and* in other treatment-seeking adolescents with obesity, but that psychosocial functioning is not necessarily impaired across other domains, although more research is needed. Additionally, given that bariatric candidates have higher BMI's than other treatment-seeking-adolescents, surgical interventions, which have been shown to produce greater weight loss than behavioral treatments in adolescents with severe obesity (7), appear appropriate for this group. Nonetheless, despite evidence that psychosocial functioning (including depressive symptoms and quality of life) generally improves in adolescents after bariatric surgery (41), prior research suggests that a subset of adolescent patients experiences clinically significant symptoms, including depressed mood, in the years following their procedure (42). Further research is needed to better understand this group of at-risk adolescents in order to determine appropriate interventions to promote psychosocial improvement after bariatric surgery.

Acknowledgments

This study was supported by National Institute of Diabetes and Digestive and Kidney Diseases (grant K23DK088532 awarded to Author RS).

BTW, MJD, JLZ, and IF, and RS conceived the study, and CC and RS carried out procedures, analyzed and interpreted data. All authors were involved in writing the paper and had final approval of the submitted and published versions.

Abbreviations

BMI body mass index

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What is already known about this subject

- Adult bariatric surgery candidates report greater eating pathology and psychological distress than adults with obesity who are not pursuing bariatric surgery.
- Uncontrolled studies suggest a subset of adolescent bariatric surgery candidates present with psychosocial impairments, including depressive symptoms, eating pathology, and impaired quality of life.
- The limited data comparing psychosocial functioning of adolescent bariatric surgery candidates to that of adolescents at a normal-weight or other adolescents with obesity are mixed.

What this study adds

- This is the first study to compare psychosocial functioning between adolescent bariatric surgery candidates and recruited samples of *both* non-surgery seeking adolescents with obesity and adolescents in the normal-weight range.
- Adolescent bariatric surgery candidates did not differ on any measure of psychosocial functioning from adolescents with obesity receiving non-surgical medical treatment.
- Both adolescent bariatric surgery candidates and adolescents with obesity receiving other medical treatment reported greater anxiety, eating pathology, and poorer quality of life than adolescents in the normal-weight range.

Total sample:
N=133 adolescents ages 13-18

Bariatric surgery candidates (n=86)

- Enrolled in bariatric surgery program
- Intending to undergo surgery, but not necessarily approved
- BMI > 40kg/m² or >35kg/m² with significant medical comorbidity

Outpatient medical-treatment-seeking adolescents (n=19)

- Receiving lifestyle modification for obesity
- BMI at or above 95th percentile for age and height

Normal-weight Adolescents (n=28)

- Community sample of adolescents
- BMI between the 25th and 85th percentile for age and height

Figure 1.

Key eligibility characteristics of bariatric surgery candidates, outpatient medical-treatment-seeking adolescents with obesity, and normal-weight adolescents.

Demographic characteristics of adolescent bariatric surgery candidates, medical-treatment-seeking adolescents with obesity, and adolescents in the normal-weight range

Table 1

	Bariatric Surgery Candidates			Medical-Treatment-Seeking Adolescents with Obesity			Normal-Weight Adolescents			<i>P</i> value
	<i>n</i> (%)	<i>M</i> (range)	<i>SD</i>	<i>n</i> (%)	<i>M</i> (range)	<i>SD</i>	<i>n</i> (%)	<i>M</i> (range)	<i>SD</i>	
Age	86 (100%)	15.88 (13–18)	1.31	19 (100%)	15.47 (14–18)	1.43	28 (100%)	15.78 (14–18)	1.37	.48
BMI	86 (100%)	48.29 (35.80–79.80)	8.15	19 (100%)	34.81 (25.40–49.20)	5.75	28 (100%)	21.10 (18.20–24.90)	1.73	<.001
Female	57 (66.3%)			12 (63.2%)			21 (75%)			.68
Race/Ethnicity										<.001
African American	15 (17.4%)			0 (0%)			4 (14.3%)			
Asian	0 (0%)			0 (0%)			2 (7.1%)			
Caucasian	27 (31.4%)			0 (0%)			12 (42.9%)			
Hispanic	39 (45.3%)			19 (100%)			10 (35.7%)			
Other	5 (5.8%)			0 (0%)			0 (0.0%)			
SES	79 (91.8%)	41.32 (16–66)	13.63	11 (57.9%)	32.95 (17–48)	10.50	27 (98.4%)	50.39 (28–66)	12.30	<.001

Note. SES = Socioeconomic Status (Four Factor Index of Social Status)

Table 2

Descriptive statistics of psychosocial functioning by group

Measure	Bariatric Surgery Candidates			Medical-Treatment-Seeking Adolescents with Obesity			Normal-Weight Adolescents		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
BIS-11-A	82	65.55	10.90	18	66.44	7.87	28	59.14	8.90
DASS									
Depression	79	5.27	6.66	19	7.58	10.44	27	1.81	2.17
Anxiety	79	5.91	5.31	19	6.05	4.81	28	1.61	2.15
Stress	82	8.29	7.71	19	8.05	7.66	28	4.43	3.77
EDE-Q									
Eating Concern	79	1.66	1.37	18	1.40	1.06	28	0.25	0.42
Restraint	80	2.46	1.21	19	2.19	1.41	28	0.38	0.65
Weight Concern	82	3.53	1.26	18	3.04	1.35	28	0.76	0.99
Shape Concern	83	3.60	1.48	18	2.98	1.73	28	0.90	0.95
Global Score	79	2.79	1.09	17	2.38	1.19	28	0.57	0.69
FAD	79	1.90	0.52	19	2.17	0.47	28	1.68	0.40
MCQ	82	.03	.03	18	.08	.23	28	.03	.10
PEDS-QL	81	67.53	18.00	18	72.64	16.95	28	86.21	10.77

Note. Means and standard deviations are for untransformed variables. BIS-11-A = Barratt Impulsiveness Scale-11-Adolescent Version; DASS = Depression Anxiety Stress Scales; EDE-Q = Eating Disorders Examination-Questionnaire; FAD = Family Assessment Device; MCQ = Monetary Choice Questionnaire (Delay Discounting); PEDS-QL = Pediatric Quality of Life Inventory.

Table 3

Regression analyses examining differences in psychosocial functioning by group

Measure	Omnibus Test			Bariatric Surgery Candidates (0) vs. Medical-Treatment-Seeking Adolescents with Obesity (1)			Bariatric Surgery Candidates (0) vs. Normal-Weight Adolescents (1)			Medical-Treatment-Seeking Adolescents with Obesity (0) vs. Normal-Weight Adolescents (1)		
	R ²	R ² _{Adj}	F	b	SE		b	SE		b	SE	
BIS-11-A	0.11	0.04	1.57	-	-	-	-	-	-	-	-	-
	0.11	0.03	1.38	-	-	-	-	-	-	-	-	-
DASS												
Depression	0.16	0.10	2.47 [*]	0.74	0.48		-0.61	0.34		-1.35 [*]	0.55	
	0.16	0.09	2.18 [*]	0.82	0.61		-0.42	0.89		-1.245	0.71	
Anxiety	0.22	0.16	3.63 ^{**}	0.28	0.40		-1.08 ^{***}	0.28		-1.36 ^{**}	0.45	
	0.23	0.16	3.31 ^{**}	0.003	0.51		-1.68 [*]	0.74		-1.69 ^{**}	0.59	
Stress	0.10	0.03	1.42	-	-	-	-	-	-	-	-	-
	0.10	0.02	1.25	-	-	-	-	-	-	-	-	-
EDE-Q												
Global Score	0.62	0.57	19.25 ^{***}	0.06	0.13		-1.02 ^{***}	0.09		-1.09 ^{***}	0.15	
	0.61	0.58	17.55 ^{***}	0.21	0.17		-0.70 ^{**}	0.24		-0.91 ^{***}	0.19	
Restraint	0.55	0.52	15.99 ^{***}	0.13	0.16		-1.14 ^{***}	0.11		-1.27 ^{***}	0.18	
	0.56	0.52	14.57 ^{***}	0.30	0.20		-0.76 ^{**}	0.20		-1.07 ^{***}	0.23	
Eating Concern	0.39	0.34	8.13 ^{***}	0.23	0.19		-0.80 ^{***}	0.13		-1.03 ^{***}	0.21	
	0.39	0.34	7.21 ^{***}	0.31	0.24		-0.63	0.35		-0.93 ^{**}	0.28	
Shape Concern	0.48	0.44	11.94 ^{***}	-0.04	0.17		-1.08 ^{***}	0.12		-1.04 ^{***}	0.20	
	0.48	0.44	10.70 ^{***}	0.09	0.22		-0.80 [*]	0.32		-0.88 ^{**}	0.25	
Weight Concern	0.60	0.57	19.23 ^{***}	-0.04	0.15		-1.16 ^{***}	0.11		-1.12 ^{***}	0.17	
	0.61	0.57	17.69 ^{***}	-0.16	0.19		-0.73 [*]	0.28		-0.89 ^{***}	0.22	
FAD	0.13	0.06	1.87	-	-	-	-	-	-	-	-	-
	0.13	0.05	1.65	-	-	-	-	-	-	-	-	-

Measure	Omnibus Test			Bariatric Surgery Candidates (0) vs. Medical-Treatment-Seeking Adolescents with Obesity (1)		Bariatric Surgery Candidates (0) vs. Normal-Weight Adolescents (1)		Medical-Treatment-Seeking Adolescents with Obesity (0) vs. Normal-Weight Adolescents (1)	
	R ²	R ² _{Adj}	F	b	SE	b	SE	b	SE
MCQ	0.11	0.04	1.56	-	-	-	-	-	-
	0.11	0.03	1.37	-	-	-	-	-	-
PEDS-QL	0.25	0.20	4.40***	0.65	5.60	16.63***	2.96	15.98*	6.43
	0.26	0.20	4.11***	-4.93	7.10	4.34	10.43	9.27	8.30

* $p < .05$.** $p < .01$.*** $p < .001$.

Note. Groups were dummy coded (0 or 1) for analyses as indicated in table header. All analyses controlled for race/ethnicity and socioeconomic status. The first line for each measure presents results without BMI as a covariate, and the second line presents results with BMI as a covariate.

BIS-11-A, DASS, and EDE-Q scales were transformed for these analyses. BIS-11-A= Barratt Impulsiveness Scale-11-Adolescent Version; DASS= Depression Anxiety Stress Scales; EDE-Q= Eating Disorders Examination-Questionnaire; FAD= Family Assessment Device; MCQ = Monetary Choice Questionnaire (Delay Discounting); PEDS-QL= Pediatric Quality of Life Inventory.