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## Self-Worth and Developmental Outcomes in Young Adults After Pediatric Bariatric Surgery

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### Abstract

**Objectives:** Bariatric surgery has emerged as a safe/effective treatment for adolescents with severe obesity; therefore, understanding its impact over the life course is imperative. This study examined self-worth and developmental outcomes during the transition to adulthood (19–24 years old) for youth who underwent surgery as adolescents (13–18 years old) and a nonsurgical group with severe obesity.

**Methods:** As part of a prospective and multi-site observational study series, adolescents (139 surgical, 83 nonsurgical) were followed to 6-years post-surgery/baseline when they completed height/weight measurements and measures of global self-worth, maturity, and occupational, educational, and social functioning as young adults. Growth curve analysis examined global self-worth change, while regressions were used to compare groups and examine adolescent reported familial predictors and weight-related correlates for outcomes.

**Results:** Relative to the nonsurgical group, the surgical group experienced significant quadratic improvement in self-worth and higher Year 6 romantic self-perceptions. For the surgical group only, greater family dysfunction predicted lower young adult self-worth and perceptions of maturity, while higher family connectedness predicted higher self-worth and perceptions of maturity. Greater percent weight loss was associated with higher perceptions of maturity for the surgical group.

**Conclusions:** Group difference findings suggest that the impact of surgery was on self-worth and romantic self-perceptions, outcomes linked in the developmental literature to body image. For both groups, functioning appeared similar to population-based findings, suggesting they are meeting “expected” age salient developmental outcomes. The impact of earlier positive family

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functioning on self-worth and self-perceptions of maturity may place adolescents on pathways to success.

### Keywords

Bariatric surgery; self-worth; adult development; severe obesity; young adulthood

Obesity in childhood or adolescence will likely persist into adulthood, with pediatric severe obesity in particular conferring high risk for adult obesity (Ward et al., 2017). This is of great public health concern given the prevalence of adolescent severe obesity (i.e., 7.7% in the United States [US], body mass index [BMI]  $\geq 120\%$  of the BMI-for-age 95<sup>th</sup> percentile) within the current obesity epidemic (Hales, Fryar, Carroll, Freedman, & Ogden, 2018; Skinner & Skelton, 2014). In the context of modest efficacy for pediatric lifestyle and pharmacologic interventions for severe obesity, bariatric surgery has emerged as a safe and effective treatment for adolescents (for a review, see (Pratt et al., 2018)), with evidence indicating improvements in weight as well as physical comorbidities and weight-related quality of life (WRQOL) post-operatively (Inge et al., 2016; Reiter-Purtill et al., 2020). However, even with impressive surgical weight loss ( $M=28\%$  of presurgical weight at 3 years post-surgery) (Inge et al., 2016), many adolescents continue to have obesity, or even severe obesity, as they enter young adulthood. With adolescent longer-term bariatric surgery outcome literature in its infancy, little research has examined developmental outcomes during the transition to adulthood, making understanding the effects of weight change and persistent obesity over the life course, imperative.

The transition from adolescence to young adulthood is a time of significant change and variability in education, work status, and relationship/living situations, with many youth focused on their self-worth, exploring adult identity and future roles, and becoming autonomous (Arnett, Zukauskienė, & Sugimura, 2014). This transition is uniquely pivotal, with successful navigation providing the groundwork for later developmental milestones in adulthood, consistent with the premise that future success is predicated on success in earlier developmental periods (Masten & Tellegen, 2012). Indeed, developmental research has indicated that earlier self-worth predicts later outcomes (Kuster, Orth, & Meier, 2013; Orth, Robins, & Widaman, 2012) although less research has addressed domain specific competencies (e.g., job competence) (von Soest, Wichstrom, & Kvaem, 2016).

While success in adulthood is often judged by competence and satisfaction in educational, occupational, and social domains, difficulties have been reported for adults with obesity, and in particular women and those with severe obesity (Puhl, Himmelstein, & Pearl, 2020). Overweight and obesity have been associated with lower educational aspirations (Clarke et al., 2013) and attainment (Clarke, O'Malley, Schulenberg, & Johnston, 2010; French et al., 2018), lower income (French et al., 2018), receipt of welfare or unemployment aid (Clarke et al., 2010), less likelihood of being partnered (French et al., 2018) or dating (Ames & Leadbeater, 2017), lower relationship satisfaction (Akers & Harding, 2021), and victimization or perceptions of interpersonal mistreatment (Ames & Leadbeater, 2017; Carr, Jaffe, & Friedman, 2008). Poor adult outcomes have been attributed to the weight-based stigmatization and discrimination that those with obesity face from a myriad of sources

(Puhl et al., 2020), yet less research has addressed these outcomes for these unique populations during the transition to adulthood nor the impact on them by factors such as family dynamics.

Risk and resilience theory (Masten & Tellegen, 2012) suggests that risks such as earlier family dysfunction or negative parenting (Aquilino & Supple, 2001) could imperil development and lead to diminished young adult outcomes. Alternatively, promotive factors such as positive family functioning (Ackerman et al., 2013; Gordon & Cui, 2015; Preston et al., 2016) could place individuals on pathways to success. For instance, positive family functioning (e.g., supportive parenting) has been found to be predictive of success in educational (Preston et al., 2016), occupational (Gordon & Cui, 2015) and social roles (Ackerman et al., 2013) while negative family functioning (e.g., conflict, control) has been predictive of poorer future well-being such as low self-esteem (Aquilino & Supple, 2001).

Family dysfunction has been associated with obesity in childhood and adolescence (Halliday, Palma, Mellor, Green, & Renzaho, 2014), with our research demonstrating that clinically significant levels of family dysfunction were prevalent among adolescents with severe obesity presenting in both behavioral and surgical weight management settings (Zeller et al., 2016). Thus, these youth may be at risk for poor developmental outcomes during the transition to adulthood. However, though research has suggested that self-worth is impaired for youth and adults with overweight or obesity (Dreber, Reynisdottir, Angelin, & Hemmingsson, 2015), surgical weight loss might render benefits to individuals as they explore identity and develop competence in preparation for future adult roles, yet this has received little attention in the literature. Some evidence indicates improvement in self-esteem after pediatric bariatric surgery (Jarvholm et al., 2020; Zeller, Reiter-Purtill, Ratcliff, Inge, & Noll, 2011). For instance, Jarvholm and colleagues (Jarvholm et al., 2020) reported a modest increase in self-esteem 5 years post-surgery for adolescents in the Swedish AMOS (Adolescent Morbid Obesity Surgery) study, with the majority reporting levels above a cutoff for low self-esteem, although no comparison group was included. Similarly, in a small study of adolescents who underwent Roux-en-Y (RYGB) as adolescents, most were meeting age-salient developmental outcomes as young adults in terms of education, social relations and work, with “normal” mean T scores of competence based on nationally representative non-referred samples of adolescents and adults (Zeller et al., 2017). Research is needed to understand whether youth who underwent bariatric surgery meet developmental outcomes during the transition to adulthood and the impact of risk and resilience factors, as well as surgical weight loss.

Using a prospective observational design, the present multi-site study examined (Aim 1) change over time in global self-worth and (Aim 2) developmental outcomes at 6 years post-surgery/baseline during the transition to adulthood (19–24 years old) for youth who underwent bariatric surgery as adolescents (13–18 years old). A nonsurgical group of youth with severe obesity provides context for understanding the role of bariatric surgery and weight change. Relative to the nonsurgical group, we expected the surgical group to demonstrate greater improvement in global self-worth. At Year 6, the surgical group were expected to report a more mature adult identity (i.e., self-perceived as confident, independent, considerate, and think of themselves as an adult), as well as higher self-

perceptions and better outcomes in key domains: occupational (i.e., self-perceptions of job competence, work experience), educational (i.e., self-perceptions of intellectual ability and creativity, seeking educational opportunities), and social (i.e., self-perceptions of romantic relationships and close friendships, romantic partnership, social support network size). In addition, (Aim 3) the effects of factors of risk (i.e., baseline family dysfunction) and factors promotive of resilience (i.e., baseline family connectedness) were examined in the prediction of select Year 6 outcomes (i.e., global self-worth, perceptions of maturity, being in school and/or having a job, and social support network size), with exploratory analyses examining whether those associations varied by surgical group. Finally, we examined the concurrent association of weight change with Year 6 outcomes separately for the surgical and nonsurgical groups.

## Method

TeenVIEW is a prospective study series tracking the psychosocial benefits and risks of bariatric surgery for adolescents, including at the 6-year post-surgical follow-up (VIEWpoint), when participants were young adults. As an ancillary to the Teen Longitudinal Assessment of Bariatric Surgery consortium (Teen-LABS; N=242, ages 13–19), a prospective observational safety and efficacy study (Inge et al., 2016), a subgroup of Teen-LABS participants were invited to participate in TeenVIEW (n=139) across 5 sites within 30 days prior to surgery. The TeenVIEW series also includes a comparative nonsurgical group (n=83) of adolescents with severe obesity recruited when presenting for behavioral weight management at the five sites and observed over the same course of time. Procedures were implemented to create a comparator group similar on demographic characteristics (i.e., sex, age, race, ethnicity) to the surgical group of whom the majority were white, non-Hispanic females, similar to national statistics (Perez et al., 2020). Efforts were made to match by race/ethnicity in otherwise eligible nonsurgical adolescents within the enrollment window, resulting in groups that were not statistically different when comparing white/non-Hispanic to all other race/ethnicities combined (Table 1). Eligibility criteria and enrollment procedures for the parent and initial ancillary study have been previously described (Inge et al., 2016; Zeller et al., 2016). Study protocols were approved by site Institutional Review Boards (Cincinnati Children’s Hospital Medical Center [lead site], Texas Children’s Hospital, Children’s Hospital of Alabama, University of Pittsburgh Medical Center, Nationwide Children’s Hospital Medical Center).

## Procedure

Study procedures have been reported previously (Zeller et al., 2016), with participation rates detailed in Figure 1. The majority of data in the current study were obtained at baseline/pre-surgery and Year 6, with global self-worth data also used at Years 1 and 2. At baseline/pre-surgery, paper/pencil measures were completed by the adolescent at each site, with heights/weights measured by trained assessors using a standardized protocol (Inge et al., 2016). At Year 6, participants completed web-based questionnaires on site or remotely. For the surgical group, heights/weights were obtained at Teen-LABS sites (n=92) or through study affiliates via home visits (n=29). For the nonsurgical group, heights/weights were obtained at a Quest Diagnostics™ location closest to their home (n=50). Self-reported

heights/weights were used for a small portion of the sample ( $n_{\text{surgical}}=7$  [weight only],  $n_{\text{nonsurgical}}=13$ ).

## Measures

### Outcomes at Year 6

**Adult Maturity.:** Adult maturity was assessed using items created for Wave 3 of the National Longitudinal Study of Adolescent Health (AddHealth) (Benson & Elder, 2011; Benson, Johnson, & Elder, 2012). Young adults rated how confident, independent, and considerate they were from “1” (very) to “4” (not at all). For the present study, items were reverse scored and averaged, with higher scores indicating self-evaluations of higher maturity. Young adults also rated how often they thought of themselves as an adult, dichotomized as “0” (never, seldom or sometimes) and “1” (most or all of the time).

**Demographic Form.:** Young adults self-reported marital status, primary living situation, number of children, current work status, type of school enrolled in if any, and highest level of education. Primary living situation was used to define living independently (e.g., alone, friends, spouse/romantic partner) versus with family of origin (e.g., with parents or other relatives).

**Self-Perception Profile for College Students (SPPCS) (Neemann & Harter, 1986).:** The SPPCS is a 54-item measure of young adult self-perceptions of competence in specific domains as well as global self-worth (i.e., how happy individuals are with their lives). Items are rated from “1” (low perceived competence) to “4” (high perceived competence), with domains scored as an average. For the present study, the global self-worth scale (5 items) as well as 5 subscales (i.e., job competence, intellectual ability, creativity, close friendships, and romantic relationships) were used. These subscales have demonstrated good validity, as well as good internal consistency ( $\alpha=0.73-0.89$ ) for the current sample.

**Sexual Activities and Attitudes Questionnaire (SAAQ) (Noll, Trickett, & Putnam, 2003).:** The SAAQ is a self-report of the frequency of voluntary sexual behaviors and attitudes. For the current study, young adults were asked if they had ever had a romantic partner (yes/no).

**Social Support Questionnaire (SSQ).:** The SSQ was adapted from the Children’s Social Support Questionnaire which has acceptable psychometrics (Bogat, Chin, Sabbath, & Schwartz, 1985). Young adults listed people in their “social network” which was summed to create a measure of network size. All analyses with this outcome controlled for baseline network size using this measure.

### Predictors/Covariates

**BMI and percent weight change.:** Height and weight were used to calculate BMI ( $\text{kg}/\text{m}^2$ ). In hypothesized analyses, percent weight change for the surgical group was calculated as  $([\text{weight}_{\text{pre-surgery}} - \text{weight}_{\text{follow-up}}]/\text{weight}_{\text{pre-surgery}})*100$ , with higher numbers indicating greater loss, while for the nonsurgical group  $([\text{weight}_{\text{follow-up}} - \text{weight}_{\text{baseline}}]/\text{weight}_{\text{baseline}})*100$ , higher numbers indicated greater gain. For the surgical

sample, weights were set to missing when the participant was identified as pregnant at Year 6 (n=7). Pregnancy data were not available for the nonsurgical sample.

**Family Assessment Device (FAD) (Epstein, Baldwin, & Bishop, 1983):** The FAD is a 60-item measure of family functioning. At baseline, the General Functioning scale assessed adolescent perception of family dysfunction, with higher scores representing greater dysfunction. This scale has demonstrated good validity, with good internal consistency for the current sample ( $\alpha=0.88$ ).

**Family Connectedness:** A 5-item scale from Add Health measured adolescents' perception of how much their family cares about or understands them, and has fun together (Resnick et al., 1997; Sieving et al., 2001). Items from 0 (not at all) to 4 (very much) were averaged, with good internal consistency for the current sample at baseline ( $\alpha=0.86$ ).

**Self-Perception Profile for Adolescents (SPPA) (Harter, 2012):** The SPPA is 45-item measure assessing self-perceptions of competence, rated from "1" (low) to "4" (high). The global self-worth scale (5 items) was used at baseline and Years 1 and 2 to examine change over time. Baseline self-perceptions of job competence, close friendships, and romantic relationships were used as covariates in analyses with the corresponding Year 6 SPPCS outcome. This measure has demonstrated good validity, as well as good internal consistency for global self-worth for the current sample ( $\alpha_{\text{baseline}}=0.80$ ;  $\alpha_{\text{Year2}}=0.87$ ).

**Additional Measures:** Additional demographics were obtained, including participant sex, age, and race/ethnicity, as well as baseline caregiver education at Presurgery/Baseline as a proxy for SES.

## Statistical Analyses

Missing data were handled via maximum likelihood estimation, with nesting of participants within sites controlled via specialized commands in Mplus. T-tests and chi-square tests examined demographic factors and BMI for surgical versus nonsurgical groups and those completing 6-year assessments versus those who did not. For hypothesized analyses, sex, race/ethnicity, age, baseline BMI, and baseline caregiver education were controlled. For aim 2 group comparisons, weighted effects coding (Te Grotenhuis et al., 2017) was used to transform race/ethnicity, allowing each group to be compared to the sample mean rather than an arbitrary reference group which is ideal for variables with unequal observations within each group. For the remaining analyses, race/ethnicity was dichotomized as white/non-Hispanic versus all other groups due to the number of independent variables in models. For some outcomes (i.e., global self-worth; self-perceptions of job competence, close friendships, romantic relationships; social support network size), corresponding baseline measures were available and controlled in analyses. For Aim 1, a growth curve model was estimated using structural equation modeling to test for change over time in global self-worth by group. For Aim 2, group differences (surgical, nonsurgical) for Year 6 outcomes were tested with linear regression for continuous variables and logistic regression for dichotomous variables. For Aim 3, associations between baseline family factors (i.e., family dysfunction; family connectedness) with selected Year 6 outcomes were examined. For



continuous outcomes, linear regressions tested pathways within each group, followed by a simple slopes test to determine whether pathway slopes differed by group. For dichotomous outcomes, moderation was tested with adapted Mplus syntax (Stride, 2015), with logistic regression models containing main effects for group and each family variable as well as their interaction. Finally, linear or logistic regressions were used to examine concurrent (Year 6) associations of percent weight change or BMI with outcomes. For aim 3 analyses, family and weight-based independent variables were tested in separate models due to potential collinearity. In addition, baseline BMI was not included in weight-based analyses due to collinearity.

## Results

### Participant Characteristics

The majority of the sample was female and non-Hispanic white, with the surgical group significantly older and with a higher baseline BMI than the nonsurgical group (see Table 1). By Year 6, the surgical group had significantly greater percent weight loss and lower BMI, with 59% of the surgical group no longer having severe obesity (BMI  $\geq 40.0$ ) relative to only 10% of the nonsurgical group. Eligible participants completing Year 6 assessments ( $n=185$ ) were not significantly different from those who did not ( $n=33$ ) for baseline self-perception subscales, as well as for group, sex, race/ethnicity, age, and BMI.

### Aims 1 and 2: Change in Global Self-Worth and Group Comparisons of Young Adult Outcomes

Longitudinal analyses examined change over time (baseline, Years 1, 2, and 6) in global self-worth by group (surgical vs. nonsurgical) after controlling for covariates (Figure 2a). Intercepts did not significantly differ by group ( $p=0.33$ ), indicating that surgical and nonsurgical groups reported similar global self-worth at baseline. However, a significant quadratic slope for the group by time interaction was indicated ( $p=0.04$ ; surgical:  $y=-0.17x^2+1.09x+1.76$ ; nonsurgical:  $y=-0.14x^2+0.90x+1.61$ ), with the surgical group exhibiting improvement to the first post-operative year with a subsequent leveling off and slight decline to Year 6. In contrast, the nonsurgical group experienced less change over time in global self-worth. Although this analysis indicates a clear group trajectory for mean global self-worth for the surgical group, there is much heterogeneity within the surgical group, evident when observed means are plotted over time after classifying participants into weight status groups using Year 6 BMI (i.e., healthy weight/overweight, obesity, severe obesity) (Figure 2b). In the broader developmental literature, self-perceived physical appearance has been indicated as an important correlate of global self-worth for youth (Neemann & Harter, 1986; von Soest et al., 2016). Thus, among surgical patients, those who reached overweight or healthy weight status might have more improved self-perceptions of appearance, with concomitant improvements in global self-worth. While beyond our original focus, post hoc examination of self-perceptions of physical appearance (SPPCS) indicated a similar quadratic trajectory to global self-worth for the surgical group (i.e., group by time interaction [surgical:  $y=-0.23x^2+1.52x+1.03$ ; nonsurgical:  $y=-0.18x^2+1.13x+1.07$ ;  $p<0.001$ ], intercept group difference [ $p=0.75$ ]).

Young adult outcomes in adult identity, educational/occupational, and social domains are presented for the surgical and nonsurgical groups in Table 2. The majority of young adults in both groups thought of themselves as an adult “most or all of the time”. Most had achieved a high school diploma or GED equivalent (surgical:  $n=117$  of 121 [96.7%]; nonsurgical:  $n=60$  of 63 [95.2%]), and were either currently in secondary education/training or employed (Table 2). Only 9.9% of young adults in the surgical group and 16.1% of young adults in the nonsurgical group reported never having a romantic partner, with 22.3% of the surgical group reporting that they were married or engaged relative to 12.7% of the nonsurgical group. A significantly greater number of young adults in the surgical group also reported having at least one child (27.3%) relative to the nonsurgical group (9.5%).

For self-perceptions of maturity, job competence, intelligence, creativity, and close friendships, no significant differences were identified between groups, with one exception. The surgical group had significantly higher self-perceptions of romantic relationships relative to the nonsurgical group when controlling for demographics, baseline BMI, and baseline romantic relationships.

### **Aim 3: Predictive Risk/Resilience Factors as well as Weight-Based Correlates of Young Adult Outcomes**

Separate regression analyses while controlling for covariates were used to examine baseline family dysfunction or family connectedness in the prediction of young adult global self-worth, perceptions of maturity, social support network size, and being in school and/or having a job and whether these associations were moderated by group (surgical vs. nonsurgical). Using simple slopes analyses, within group results of linear regressions (Table 3) indicate that for the surgical group, greater family dysfunction was significantly predictive of lower young adult global self-worth and lower perceptions of maturity. In contrast, higher levels of adolescent reported family connectedness were significantly predictive of higher young adult global self-worth and higher perceptions of maturity. No significant predictive associations were identified between family variables and social support network size. Within group results for the nonsurgical group indicated no significant predictive associations across outcomes. Tests of significant moderation by group indicated one significant finding for earlier family dysfunction in the prediction of Year 6 global self-worth. For in school/having a job, logistic regressions while controlling for covariates were completed with group, baseline family functioning (either family dysfunction or family connectedness) and a group by family functioning interaction as predictors. No significant associations were identified for main effects or interactions for family dysfunction (main effect  $p=0.30$ ,  $OR=0.64$ ; interaction  $p=0.50$ ,  $OR=1.76$ ) or for family connectedness (main effect  $p=0.68$ ,  $OR=1.08$ ; interaction  $p=0.76$ ,  $OR=1.16$ ) in the prediction of current school/work.

**Aim 3: Weight-Based Correlates of Young Adult Outcomes**—Finally, separate regression analyses by group (surgical and nonsurgical) while controlling for covariates were completed to examine concurrent associations of percent weight change and BMI with young adult global self-worth, perceptions of maturity, being in school and/or having a job and social support network size (see Table 4). Three participants in the surgical group



who underwent adjustable gastric banding were excluded. One significant association was identified. For the surgical group, greater percent weight loss was associated with higher self-perceptions of maturity.

## Discussion

As pediatric bariatric surgery gains acceptance, understanding its impact over the life course has become increasingly important. Developmental transitions to young adulthood have received little attention in the literature focused on youth with severe obesity or those who have had bariatric surgery. Longitudinal examination of global self-worth indicated that although groups were not significantly different at baseline, the surgical group experienced greater improvement relative to nonsurgical comparators, with the greatest change in the first year post-operatively, and a leveling off and slight decline thereafter. This is consistent with AMOS results in which adolescents were found to experience improvement in mean levels of self-concept over 5-years post-gastric bypass (Jarvholm et al., 2020). However, in the current study, noteworthy heterogeneity was observed within the surgical group based on year 6 weight status (see Figure 2) which is not adequately captured when focusing only on overall group means nor when examining the cross-sectional associations of Year 6 global self-worth with weight variables (i.e., percent weight change, BMI) which were nonsignificant. Noting self-perceived physical appearance as an important correlate of global self-worth for youth (Neemann & Harter, 1986; von Soest et al., 2016), post hoc analyses suggested a similar trajectory as global self-worth. Thus, surgical patients who reached overweight or healthy weight status might have experienced greater improvements in self-perceptions of appearance, influencing improvements in global self-worth (Neemann & Harter, 1986; von Soest et al., 2016). This may also explain the significantly higher Year 6 romantic relationship self-perceptions of the surgical group relative to the nonsurgical group, as self-perceptions of physical appearance may play a role in romantic involvement/satisfaction (Furman & Winkles, 2010). When the group comparison model for romantic relationships was re-run with self-perceptions of physical appearance at Year 6 added, appearance ( $B=0.55$ ,  $p<.001$ ) but not group ( $B=0.28$ ,  $p=0.12$ ) was significant.

When examining Year 6 developmental outcomes, results indicated that most were doing well, with few significant differences between surgical and nonsurgical groups. When applicable, published data during the study window from the US Census Bureau and Pew Research Center were used below as comparison points for developmental outcomes for both groups relative to similar age peers. We acknowledge inherent challenges including varying time periods and metrics as well as demographic differences between our sample (i.e., mostly female, non-Hispanic white) and national samples. Almost all young adults had achieved a high school diploma/GED and were either in a secondary education program and/or were employed. In terms of college enrollment, 71.9% of the surgical and 50.8% of the nonsurgical group had some college experience. Although comparisons to national data regarding college experience are difficult due to differences in metrics, census data (2012–2015) on college enrollment for young adult Americans (51.9% of Americans ages 20–21 and 29.1% ages 22–24) (Schmidt, 2018) suggest that both groups were similar to their same-age peers. Census data during the study time period characterizing young adult (ages 18–24) living arrangements indicated that 55% lived with their parents (US

Census Bureau 2020). While participants in the surgical group appear similar (49.6%), fewer nonsurgical participants had made the transition to living independently of their family of origin (28.6%).

Most of the current cohort had also experienced a romantic relationship. Although not significantly different, more participants in the surgical group (22.3%) were married/engaged relative to the nonsurgical group (12.7%). In this regard, the nonsurgical group was more similar to their peers, with U.S. census data (ages 20–24 in 2016) indicating that 13.2% of women and 7.8% of men reported ever being married (Mayol-Garcia, 2021). Moreover, those in the surgical group (27.3%) had significantly higher odds of being a parent relative to the nonsurgical group (9.5%). The average age at first birth for females in the U.S. was 26.4 years in 2015 (Livingston, 2018). While data regarding whether parenthood was planned or not were not collected for the current sample, it is important to note that fertility potentially improves following bariatric surgery (Pratt et al., 2018). Regardless, a subgroup of the surgical sample appears to have transitioned to some adult roles (i.e., marriage, parenthood) earlier than peers. Although early family formation has been linked to less investment in post-secondary education (Oesterle, Hawkins, Hill, & Bailey, 2010), post hoc analyses suggest that for the surgical sample, the majority of those with children (n=33), whether married/engaged (n=14) or single (n=19), were currently attending or had graduated from post-secondary educational training (n=24/33; 73%).

Within group results of the simple slopes analyses suggested that family factors including adolescent self-reports of dysfunction and connectedness at baseline were significant predictors of Year 6 global self-worth and adult maturity for the surgical sample. This is consistent with extant research suggesting the importance of family variables as both factors of risk and resilience for developmental outcomes (Ackerman et al., 2013; Aquilino & Supple, 2001; Gordon & Cui, 2015; Masten & Tellegen, 2012; Preston et al., 2016). However, family factors were not predictive of social support network size. In contrast, none of the family variables were significantly associated with these Year 6 outcomes for the nonsurgical sample, although only one test of moderation was significant suggesting few differences across groups. Nonsignificant within groups results may reflect a dampening of the potency of these predictors due to the high frequency of poor family functioning for the majority of these youth at baseline, of whom 72% reported clinical range dysfunction on the FAD General Functioning scale (Zeller et al., 2016). For current school/work, main effects of family variables were not significant for the total sample, in contrast to results from Gordon and colleagues, who demonstrated the predictive associations between adolescent report of positive parenting (i.e., involved, supportive) with young adult career outcomes (Gordon & Cui, 2015). Older age at assessment (aged 24–32 years) and broader focus on career success (e.g., autonomy, satisfaction, commitment, income) may have contributed to the discrepancy with current findings.

In terms of clinical implications, these results underscore the important role of pediatric/health psychologists or other mental health providers in obesity care settings. Assessing family functioning and self-worth from the perspectives of adolescents with severe obesity presenting for pre-surgical evaluations or within non-surgical care settings may inform treatment of psychosocial difficulties and potentially optimize developmental outcomes. For

adolescents presenting with supportive and healthy family relationships, ongoing care should encourage the continued promotion of those relationships. Adolescents who perceive a lack of family support will benefit from adjunctive family-based interventions targeted to address dysfunction. In addition, cognitive behavioral approaches and general clinical practices that encourage body positivity and acceptance of a larger body size are needed.

Strengths of the present study include a design that prospectively followed adolescents from 5 sites over time as well as the inclusion of a nonsurgical group with severe obesity for reference. Moreover, a multi-dimensional approach to understanding young adult outcomes at a point of developmental transition has not been undertaken to our knowledge for adolescents with persistent severe obesity and those who have experienced pediatric bariatric surgery. Limitations included a primarily female and white surgical sample, which although consistent with the demographic characteristics of those who typically get bariatric surgery (Perez et al., 2020), limits generalizability for males and other racial/ethnic groups at risk for severe obesity. These issues are particularly salient as definitions of a “successful” transition to adulthood often vary by cultural context and are affected by disparities due to socioeconomic status, gender, race/ethnicity, and other sociodemographic statuses (Scales et al., 2016). In addition, the age range of the cohort at Year 6 represents both those who were beginning the transition to young adulthood (e.g., starting college or entering employment) as well as those who are completing the transition (e.g., employed, married with children). As such, we focused on general indicators of this transition such as exploration of self-worth, adult identity, and future roles, summarizing across some domains (e.g., marital status, children). Future studies with a larger sample would allow a focus on more discrete age ranges, while the inclusion of a demographically similar group of young adults of a range of weights would provide an additional comparator context rather than relying on national statistics.

## Conclusion

Overall, findings indicate that the impact of bariatric surgery was associated with global self-worth and self-perceived romantic competence, outcomes linked in the developmental literature to self-perceptions of physical appearance. Young adult perceptions of themselves as more mature (i.e., more confident, independent, considerate) were also associated with greater weight loss for the surgical group. For both surgical and nonsurgical groups, functioning in educational/occupational and social roles during the transition to young adulthood appeared similar to population-based statistics (e.g., census data), suggesting they are meeting “expected” age salient developmental outcomes, which is discrepant with the adult literature indicating difficulties in competence and satisfaction in these domains for those with obesity. Perhaps problems will become apparent over time as the majority of the surgical group at Year 6 had obesity (35%) or severe obesity (42%) in addition to a nonsurgical group with persistent severe obesity, and thus some may face prejudice and discrimination due to their weight status. It is noteworthy that there is a small subgroup of participants at Year 6 who were currently not in any post-secondary training or employed (Surgical: 21/121, 17%; Nonsurgical: 13/63, 21%), and thus, may be at risk for poor developmental outcomes. Conversely, it may be that for some, particularly in the surgical

group, the influence of earlier positive family functioning served to place them on pathways to success in adulthood.

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## References

- Ackerman RA, Kashy DA, Donnellan MB, Nepl T, Lorenz FO, & Conger RD (2013). The interpersonal legacy of a positive family climate in adolescence. *Psychological Science*, 24(3), 243–250. doi:10.1177/0956797612447818 [PubMed: 23307941]
- Akers AY, & Harding J (2021). The Timing of Obesity Matters: Associations Between Current Versus Chronic Obesity since Adolescence and Romantic Relationship Satisfaction Among Young Adult Women. *Womens Health Issues*, 31(5), 462–469. doi:10.1016/j.whi.2021.05.001 [PubMed: 34127367]
- Ames M, & Leadbeater B (2017). Overweight and isolated: The interpersonal problems of youth who are overweight from adolescence into young adulthood. *International Journal of Behavioral Development*, 41(3), 390–404. doi:10.1177/0165025416647799
- Aquilino WS, & Supple AJ (2001). Long-term effects of parenting practices during adolescence on well-being: Outcomes in young adulthood. *Journal of Family Issues*, 22(3), 289–308. doi:10.1177/019251301022003002
- Arnett JJ, Zukauskienė R, & Sugimura K (2014). The new life stage of emerging adulthood at ages 18–29 years: implications for mental health. *Lancet Psychiatry*, 1(7), 569–576. doi:10.1016/S2215-0366(14)00080-7 [PubMed: 26361316]
- Benson JE, & Elder GH Jr. (2011). Young adult identities and their pathways: A developmental and life course model. *Developmental Psychology*, 47(6), 1646–1657. doi:10.1037/a0023833
- Benson JE, Johnson MK, & Elder GH Jr. (2012). The implications of adult identity for educational and work attainment in young adulthood. *Developmental Psychology*, 48(6), 1752–1758. doi:10.1037/a0026364 [PubMed: 22103305]
- Bogat G, Chin R, Sabbath W, & Schwartz CJELMSU (1985). The children's social support questionnaire (Technical report# 3).
- Carr D, Jaffe KJ, & Friedman MA (2008). Perceived interpersonal mistreatment among obese Americans: do race, class, and gender matter? *Obesity (Silver Spring)*, 16 Suppl 2, S60–68. doi:10.1038/oby.2008.453
- Clarke PJ, O'Malley PM, Schulenberg JE, & Johnston LD (2010). Midlife health and socioeconomic consequences of persistent overweight across early adulthood: findings from a national survey of American adults (1986–2008). *American Journal of Epidemiology*, 172(5), 540–548. doi:10.1093/aje/kwq156 [PubMed: 20610468]

- Clarke PJ, O'Malley PM, Schulenberg JE, Lee H, Colabianchi N, & Johnston LD (2013). College expectations in high school mitigate weight gain over early adulthood: Findings from a national study of American youth. *Obesity (Silver Spring)*, 21(7), 1321–1327. doi:10.1002/oby.20176 [PubMed: 23666817]
- Dreber H, Reynisdottir S, Angelin B, & Hemmingsson E (2015). Who is the Treatment-Seeking Young Adult with Severe Obesity: A Comprehensive Characterization with Emphasis on Mental Health. *PLoS One*, 10(12), e0145273. doi:10.1371/journal.pone.0145273 [PubMed: 26694031]
- Epstein NB, Baldwin LM, & Bishop D (1983). The McMaster family assessment device. *Journal of Marital Family Therapy*, 9(2), 171–180.
- French SA, Wall M, Corbeil T, Sherwood NE, Berge JM, & Neumark-Sztainer D (2018). Obesity in Adolescence Predicts Lower Educational Attainment and Income in Adulthood: The Project EAT Longitudinal Study. *Obesity (Silver Spring)*, 26(9), 1467–1473. doi:10.1002/oby.22273 [PubMed: 30226010]
- Furman W, & Winkles JK (2010). Predicting romantic involvement, relationship cognitions, and relationship qualities from physical appearance, perceived norms, and relational styles regarding friends and parents. *Journal of Adolescence*, 33(6), 827–836. doi:10.1016/j.adolescence.2010.07.004 [PubMed: 20800891]
- Gordon MS, & Cui M (2015). Positive parenting during adolescence and career success in young adulthood. *Journal of Child and Family Studies*, 24(3), 762–771. doi:10.1007/s10826-013-9887-y
- Hales CM, Fryar CD, Carroll MD, Freedman DS, & Ogden CL (2018). Trends in Obesity and Severe Obesity Prevalence in US Youth and Adults by Sex and Age, 2007–2008 to 2015–2016. *JAMA*, 319(16), 1723–1725. doi:10.1001/jama.2018.3060 [PubMed: 29570750]
- Halliday JA, Palma CL, Mellor D, Green J, & Renzaho AM (2014). The relationship between family functioning and child and adolescent overweight and obesity: a systematic review. *International Journal of Obesity (Lond)*, 38(4), 480–493. doi:10.1038/ijo.2013.213
- Harter SJ (2012). *Self-Perception Profile for Adolescents: Manual and Questionnaires*. Denver, CO: University of Denver, Department of Psychology; 2012.
- Inge TH, Courcoulas AP, Jenkins TM, Michalsky MP, Helmrath MA, Brandt ML, ... Buncher CR (2016). Weight Loss and Health Status 3 Years after Bariatric Surgery in Adolescents. *New England Journal of Medicine*, 374(2), 113–123. doi:10.1056/NEJMoa1506699 [PubMed: 26544725]
- Jarvholm K, Bruze G, Peltonen M, Marcus C, Flodmark CE, Henfridsson P, ... Olbers T (2020). 5-year mental health and eating pattern outcomes following bariatric surgery in adolescents: a prospective cohort study. *Lancet Child and Adolescent Health*, 4(3), 210–219. doi:10.1016/S2352-4642(20)30024-9 [PubMed: 31978372]
- Kuster F, Orth U, & Meier LL (2013). High self-esteem prospectively predicts better work conditions and outcomes. *Social Psychological and Personality Science*, 4(6), 668–675. doi:10.1177/1948550613479806
- Livingston G (2018). U.S. Women are postponing motherhood, but not as much as those in most other developed nations. Retrieved from <https://www.pewresearch.org/fact-tank/2018/06/28/u-s-women-are-postponing-motherhood-but-not-as-much-as-those-in-most-other-developed-nations/>
- Masten AS, & Tellegen A (2012). Resilience in developmental psychopathology: contributions of the Project Competence Longitudinal Study. *Developmental Psychopathology*, 24(2), 345–361. doi:10.1017/S095457941200003X
- Mayol-Garcia YG, Benjamin; Kreider Rose. (2021). Number, Timing, and Duration of Marriages and Divorces: 2016. Retrieved from Washington, D.C.: <https://www.census.gov/library/publications/2021/demo/p70-167.html>
- Neemann J, & Harter S (1986). *Manual for the self-perception profile for college students*: University of Denver.
- Noll JG, Trickett PK, & Putnam FW (2003). A prospective investigation of the impact of childhood sexual abuse on the development of sexuality. *Journal of Consulting and Clinical Psychology*, 71(3), 575–586. doi:10.1037/0022-006X.71.3.575 [PubMed: 12795580]



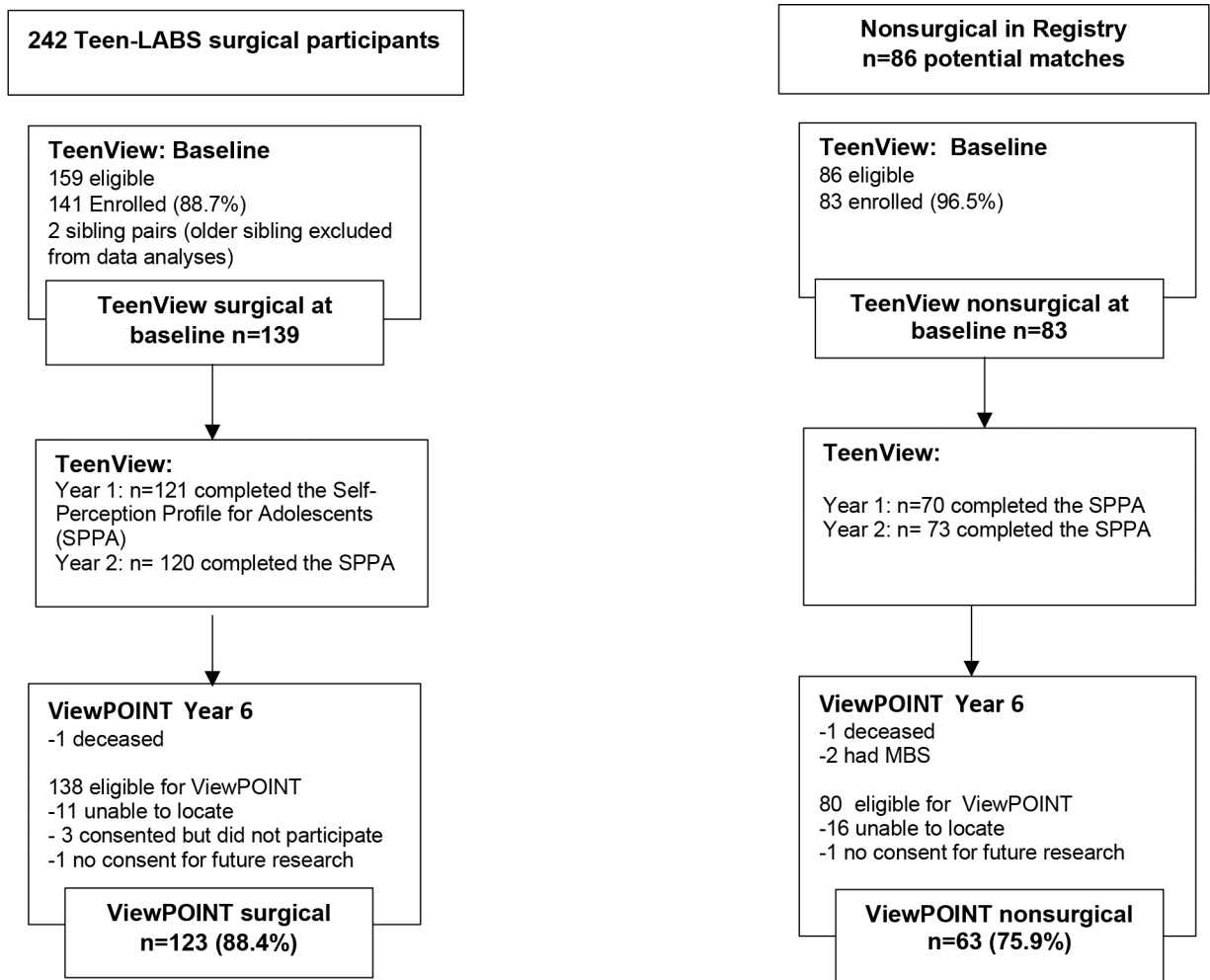
- Oesterle S, Hawkins JD, Hill KG, & Bailey JA (2010). Men's and Women's Pathways to Adulthood and Their Adolescent Precursors. *J Marriage Fam*, 72(5), 1436–1453. doi:10.1111/j.1741-3737.2010.00775.x [PubMed: 21113316]
- Orth U, Robins RW, & Widaman KF (2012). Life-span development of self-esteem and its effects on important life outcomes. *Journal of Personality and Social Psychology*, 102(6), 1271–1288. doi:10.1037/a0025558 [PubMed: 21942279]
- Perez NP, Westfal ML, Stapleton SM, Stanford FC, Griggs CL, Pratt JS, ... Kelleher CM (2020). Beyond insurance: race-based disparities in the use of metabolic and bariatric surgery for the management of severe pediatric obesity. *Surgery for Obesity and Related Diseases*, 16(3), 414–419. doi:10.1016/j.soard.2019.11.020 [PubMed: 31917198]
- Pratt JSA, Browne A, Browne NT, Bruzoni M, Cohen M, Desai A, ... Zitsman J (2018). ASMBS pediatric metabolic and bariatric surgery guidelines, 2018. *Surgery for Obesity and Related Diseases*, 14(7), 882–901. doi:10.1016/j.soard.2018.03.019 [PubMed: 30077361]
- Preston KSJ, Gottfried AW, Oliver PH, Gottfried AE, Delany DE, & Ibrahim SM (2016). Positive family relationships: Longitudinal network of relations. *Journal of Family Psychology*, 30(7), 875–885. doi:10.1037/fam0000243.10.1037/fam0000243.supp (Supplemental) [PubMed: 27690499]
- Puhl RM, Himmelstein MS, & Pearl RL (2020). Weight stigma as a psychosocial contributor to obesity. *American Psychologist*, 75(2), 274–289. doi:10.1037/amp0000538 [PubMed: 32053000]
- Reiter-Purtill J, Ley S, Kidwell KM, Mikhail C, Austin H, Chaves E, ... Teen LC (2020). Change, predictors and correlates of weight- and health-related quality of life in adolescents 2-years following bariatric surgery. *International Journal of Obesity (Lond)*, 44(7), 1467–1478. doi:10.1038/s41366-019-0394-0
- Resnick MD, Bearman PS, Blum RW, Bauman KE, Harris KM, Jones J, ... Udry JR (1997). Protecting adolescents from harm. Findings from the National Longitudinal Study on Adolescent Health. *JAMA*, 278(10), 823–832. doi:10.1001/jama.278.10.823 [PubMed: 9293990]
- Scales PC, Benson PL, Oesterle S, Hill KG, Hawkins JD, & Pashak TJ (2016). The dimensions of successful young adult development: A conceptual and measurement framework. *Applied Developmental Science*, 20(3), 150–174. doi:10.1080/10888691.2015.1082429
- Schmidt E (2018). Postsecondary Enrollment Before, During, and Since the Great Recession. Retrieved from Washington, D.C.: <https://www.census.gov/library/publications/2018/demo/p20-580.html>
- Sieving RE, Beuhring T, Resnick MD, Bearinger LH, Shew M, Ireland M, & Blum RW (2001). Development of adolescent self-report measures from the National Longitudinal Study of Adolescent Health. *Journal of Adolescent Health*, 28(1), 73–81. doi:10.1016/s1054-139x(00)00155-5
- Skinner AC, & Skelton JA (2014). Prevalence and trends in obesity and severe obesity among children in the United States, 1999–2012. *JAMA Pediatrics*, 168(6), 561–566. doi:10.1001/jamapediatrics.2014.21 [PubMed: 24710576]
- Stride CB, G. S., Catley N & Thomas F (2015). Mplus code for mediation, moderation, and moderated mediation models. Retrieved from <http://www.offbeat.group.shef.ac.uk/FIO/mplusmedmod.htm>
- Te Grotenhuis M, Pelzer B, Eisinga R, Nieuwenhuis R, Schmidt-Catran A, & Konig R (2017). When size matters: advantages of weighted effect coding in observational studies. *International Journal of Public Health*, 62(1), 163–167. doi:10.1007/s00038-016-0901-1 [PubMed: 27796415]
- United States Census Bureau. (2020). Census Bureau Releases New Estimates on America's Families and Living Arrangements. Retrieved from <https://www.census.gov/newsroom/press-releases/2020/estimates-families-living-arrangements.html>
- von Soest T, Wichstrom L, & Kvaem IL (2016). The development of global and domain-specific self-esteem from age 13 to 31. *Journal of Personality and Social Psychology*, 110(4), 592–608. doi:10.1037/pspp0000060 [PubMed: 26167796]
- Ward ZJ, Long MW, Resch SC, Giles CM, Cradock AL, & Gortmaker SL (2017). Simulation of Growth Trajectories of Childhood Obesity into Adulthood. *New England Journal of Medicine*, 377(22), 2145–2153. doi:10.1056/NEJMoa1703860 [PubMed: 29171811]
- Zeller MH, Hunsaker S, Mikhail C, Reiter-Purtill J, McCullough MB, Garland B, ... Smith K (2016). Family factors that characterize adolescents with severe obesity and their role in weight loss



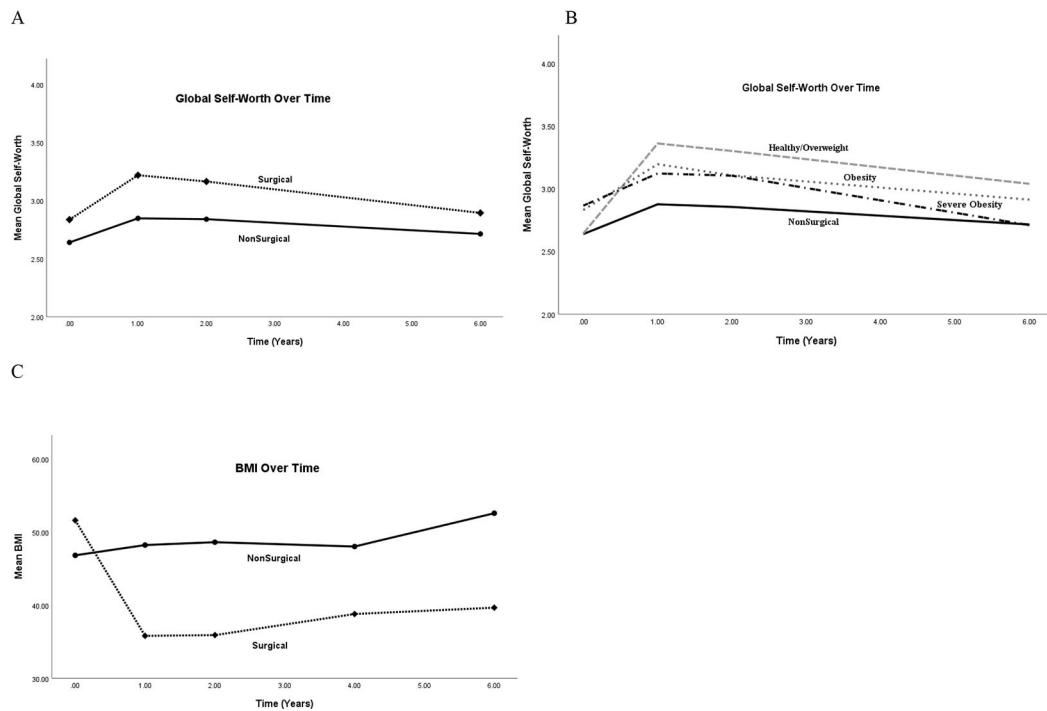
surgery outcomes. *Obesity (Silver Spring)*, 24(12), 2562–2569. doi:10.1002/oby.21676 [PubMed: 27753228]

Zeller MH, Pendery EC, Reiter-Purtill J, Hunsaker SL, Jenkins TM, Helmrath MA, & Inge TH (2017). From adolescence to young adulthood: trajectories of psychosocial health following Roux-en-Y gastric bypass. *Surgery for Obesity and Related Diseases*, 13(7), 1196–1203. doi:10.1016/j.soard.2017.03.008 [PubMed: 28465159]

Zeller MH, Reiter-Purtill J, Ratcliff MB, Inge TH, & Noll JG (2011). Two-year trends in psychosocial functioning after adolescent Roux-en-Y gastric bypass. *Surgery for Obesity and Related Diseases*, 7(6), 727–732. doi:10.1016/j.soard.2011.01.034 [PubMed: 21497142]



**Figure 1.**  
Participant Recruitment and Retention



**Figure 2. Change in Global Self-Worth (2A and 2B) and BMI (2C) over Time**

Note: Observed means for global self-worth (2A) were plotted for surgical and nonsurgical groups over time. Longitudinal analyses within a structural equation modeling framework indicated a significant quadratic group by time interaction (surgical:  $y = -0.17x^2 + 1.09x + 1.76$ ; nonsurgical:  $y = -0.14x^2 + 0.90x + 1.61$ ;  $p = 0.04$ ). Intercepts did not differ significantly by group. Observed means (2B) were also plotted for surgical patients classified by BMI group at Year 6 and for the nonsurgical group. BMI classifications were healthy/overweight (healthy BMI=18.5–24.9,  $n=3$ /overweight BMI=25.0–29.9,  $n=25$ ), obesity (BMI=30.0–39.9,  $n=40$ ), and severe obesity (BMI>40.0,  $n=48$ ). Observed BMI over time for surgical and nonsurgical groups (2C) is provided as context.

**Table 1**

## Participant Characteristics for Surgical and Nonsurgical Groups

Participant characteristics	Surgical Mean $\pm$ SD n (%)	Nonsurgical Mean $\pm$ SD n (%)	<i>p</i> <sup>a</sup>
<b>Baseline</b>	<b>n=139</b>	<b>n=83</b>	
Sex (Female)	111 (79.9%)	68 (81.9%)	0.71
<b>Race/Ethnicity (White/Non-Hispanic vs. all other groups)</b>			0.08
White/Non-Hispanic	92 (66.2%)	45 (54.2%)	
Black/Non-Hispanic	25 (18.0%)	33 (39.8%)	
Multi-racial/Non-Hispanic	12 (8.6%)	-	
Hispanic	10 (7.2%)	5 (6.0%)	
Age	16.86 $\pm$ 1.39	16.11 $\pm$ 1.40	<0.001
BMI (kg/m <sup>2</sup> )	51.64 $\pm$ 8.35	46.85 $\pm$ 6.12	<0.001
Caregiver Education (% High School) <sup>b</sup>	53 (39.0%)	38 (47.5%)	0.22
<b>Year 6</b>	<b>n=123</b>	<b>n=63</b>	
Age	23.0 $\pm$ 1.4	22.4 $\pm$ 1.4	0.004
BMI (kg/m <sup>2</sup> ) <sup>c</sup>	39.7 $\pm$ 11.4	52.6 $\pm$ 11.3	<0.001
Healthy (18.5–24.9)	3 (2.5%)	-	
Overweight (25–29.9)	25 (21.2%)	4 (6.3%)	
Class 1 (30–34.9)	20 (16.9%)	-	
Class 2 (35–39.9)	21 (17.8%)	2 (3.2%)	
Class 3 (40.0)	49 (41.5%)	57 (90.5%)	
%Weight Change from Baseline <sup>d,e</sup>	-22.4 $\pm$ 16.8	14.0 $\pm$ 21.2	<0.001

Note. Abbreviations: BMI= Body Mass Index

<sup>a</sup> *p*-values are based on two-tailed independent t-tests when examining mean values and on Chi-Square tests when examining percentages.

<sup>b</sup> Missing for n=3 Surgical and n=3 Nonsurgical.

<sup>c</sup> Missing for n=5 Surgical

<sup>d</sup> Missing for n=2 Surgical.

<sup>e</sup>  $((\text{weight}_{\text{year6}} - \text{weight}_{\text{pre-surgery/baseline}}) / \text{weight}_{\text{pre-surgery/baseline}}) * 100$ , with negative values indicative of weight loss.

**Table 2**

Young Adult Outcomes at Year 6 for Surgical and Nonsurgical Groups

Year 6 Domains and Outcomes	Surgical n=122	Nonsurgical n=63	<i>B</i> or <i>OR</i> <sup>b</sup>	95% CI for <i>B</i> or <i>OR</i> <sup>b</sup>	<i>P</i>
	Mean ± SD n (%) <sup>a</sup>	Mean ± SD n (%) <sup>a</sup>			
<b>Adult Identity</b> <sup>c</sup>					
Maturity	3.34 ± 0.54	3.14 ± 0.59	0.22	-0.15, 0.54	0.18
Consider Self Adult	97 (79.5%)	51 (82.3%)	0.80	0.45, 1.43	0.46
Living Independently	60 (49.6%)	18 (28.6%)	2.20	0.97, 4.96	0.06
<b>Occupational/Educational</b>					
Self-Perceived Job Competence <sup>d,e</sup>	3.22 ± 0.68	3.07 ± 0.60	0.15	-0.01, 0.34	0.16
Self-Perceived Intellectual Ability <sup>d</sup>	3.13 ± 0.78	3.04 ± 0.69	0.02	-0.15, 0.22	0.82
Self-Perceived Creativity <sup>d</sup>	3.03 ± 0.82	2.92 ± 0.66	0.11	-0.11, 0.42	0.43
Ever/Current Post-Secondary Education <sup>f</sup>	94 (77.7%)	38 (60.3%)	1.79	0.69, 4.60	0.23
Currently In School and/or Have a Job <sup>f</sup>	100 (82.6%)	50 (79.4%)	1.39	0.87, 2.21	0.17
<b>Social</b>					
Self-Perceived Romantic Relationships <sup>d,e</sup>	2.58 ± 0.98	2.24 ± 0.86	0.55	0.13, 1.00	0.02
Self-Perceived Close Friendships <sup>d,e</sup>	2.92 ± 0.85	2.80 ± 0.84	0.07	-0.08, 0.24	0.45
Ever/Current Romantic Partner <sup>g</sup>	109 (90.1%)	52 (83.9%)	4.02	0.84, 19.26	0.08
Married or Engaged <sup>f</sup>	27 (22.3%)	8 (12.7%)	1.45	0.39, 5.46	0.58
At least one child <sup>f</sup>	33 (27.3%)	6 (9.5%)	3.60	1.95, 6.64	<0.001
Social Support Network Size <sup>e</sup>	4.79 ± 3.28	5.57 ± 2.99	-1.28	-2.97, -0.13	0.11

<sup>a</sup> Means and standard deviations (SD) are reported for continuous outcomes; n's and percentages for categorical outcomes.

<sup>b</sup> To examine group (surgical versus nonsurgical) differences, linear regressions were calculated for continuous outcomes with unstandardized *B*s and 95% confidence intervals (CI) reported; logistic regressions were calculated for categorical outcomes with odds ratios (OR) and 95% CIs reported. In all regressions, sex, race/ethnicity, age, parental education at baseline, and body mass index at baseline were included as control variables.

<sup>c</sup> Missing for n=1 Nonsurgical.

<sup>d</sup> Missing for n=3 Surgical.

<sup>e</sup> For regression models examining these outcomes, corresponding baseline measures were also controlled.

<sup>f</sup> Missing for n=1 Surgical.

<sup>g</sup> Missing for n=1 Surgical and n=1 Nonsurgical.

**Table 3**

Factors of Risk (i.e., baseline family dysfunction) and Factors Promotive of Resilience (i.e., baseline family connectedness) Predicting Young Adult Outcomes at Year 6

Outcome	Surgical			Nonsurgical			Moderation p-value
	<i>B</i>	p-value	95% CI for <i>B</i>	<i>B</i>	p-value	95% CI for <i>B</i>	
<b>Global Self-Worth</b>							
<b>Model 1: Baseline Family Dysfunction</b>	-0.21	0.02	-0.42, -0.14	0.07	0.52	-0.09, 0.31	0.03
<b>Model 2: Baseline Family Connectedness</b>	0.25	0.01	0.11, 0.48	0.01	0.94	-0.23, 0.11	0.14
<b>Adult Maturity</b>							
<b>Model 1: Baseline Family Dysfunction</b>	-0.16	0.03	-0.32, -0.03	-0.11	0.21	-0.30, -0.001	0.48
<b>Model 2: Baseline Family Connectedness</b>	0.17	<0.001	0.13, 0.25	0.16	0.21	0.07, 0.48	0.90
<b>Social Support Network Size</b>							
<b>Model 1: Baseline Family Dysfunction</b>	0.17	0.86	-1.99, 1.17	-0.48	0.63	-2.24, 1.01	0.63
<b>Model 2: Baseline Family Connectedness</b>	-0.03	0.96	-0.65, 1.33	-0.09	0.90	-1.22, 1.58	0.95

*Note.* Simple slopes analyses were conducted in which linear regression pathways from family variables to outcomes were tested separately within each group, followed by a test to determine whether the slopes of those pathways differed (i.e., were moderated) by group. For each model, sex, race/ethnicity, age, baseline BMI, and baseline caregiver education were controlled. Baseline global self-worth and social support were also controlled in corresponding models.



**Table 4**

Concurrent (Year 6) Associations of Percent Weight Change and BMI with Young Adult Outcomes for the Surgical and Nonsurgical Groups

	Surgical			Nonsurgical		
	<i>B</i>	p-value	95% CI for <i>B</i>	<i>B</i>	p-value	95% CI for <i>B</i>
<b>Global Self-Worth</b>						
<b>Model 1: Percent Weight Change</b>	0.01	0.13	0.003, 0.02	-0.002	0.67	-0.01, 0.01
<b>Model 2: Year 6 BMI</b>	-0.01	0.29	-0.03, -0.004	-0.004	0.60	-0.02, 0.01
<b>Adult Maturity</b>	<i>B</i>	p-value	95% CI for <i>B</i>	<i>B</i>	p-value	95% CI for <i>B</i>
<b>Model 1: Percent Weight Change</b>	0.01	0.003	0.006, 0.02	0.004	0.57	-0.01, 0.01
<b>Model 2: Year 6 BMI</b>	-0.01	0.16	-0.01, 0.003	<0.001	0.99	-0.03, 0.03
<b>In School and/or Have Job</b>	<i>OR</i>	p-value	95% CI for <i>OR</i>	<i>OR</i>	p-value	95% CI for <i>OR</i>
<b>Model 1: Percent Weight Change</b>	1.01	0.60	0.98, 1.05	0.98	0.49	0.93, 1.04
<b>Model 2: Year 6 BMI</b>	0.99	0.51	0.96, 1.02	0.96	0.08	0.92, 1.00
<b>Social Support Network Size</b>	<i>B</i>	p-value	95% CI for <i>B</i>	<i>B</i>	p-value	95% CI for <i>B</i>
<b>Model 1: Percent Weight Change</b>	0.02	0.55	-0.09, 0.06	-0.01	0.70	-0.02, 0.04
<b>Model 2: Year 6 BMI</b>	-0.004	0.94	-0.12, 0.11	0.02	0.75	-0.06, 0.14

Note. For the Surgical sample, percent weight change was calculated as  $[\text{weight}_{\text{presurgery}} - \text{weight}_{\text{Year 6}}] / \text{weight}_{\text{presurgery}} * 100$ , with higher numbers indicating greater weight loss. For the Nonsurgical sample, percent weight change was calculated as  $[\text{weight}_{\text{Year 6}} - \text{weight}_{\text{baseline}}] / \text{weight}_{\text{presurgery}} * 100$ , with higher numbers indicating greater weight gain. For the Surgical group only ( $n=136$ ),  $n=3$  who underwent adjustable gastric banding procedure were excluded for these analyses. Linear regressions were completed for continuous outcomes (global self-worth, adult maturity, and social support network size), and a logistic regression was completed for the dichotomous outcome (school/job). For each model, sex, race/ethnicity, age, and baseline caregiver education were controlled.