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The Complexity of Body Image Following Bariatric Surgery: A Systematic Review of the Literature

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Abstract

Poor body image is common among individuals seeking bariatric surgery and is associated with adverse psychosocial sequelae. Following massive weight loss secondary to bariatric surgery, many individuals experience excess skin and associated concerns, leading to subsequent body contouring procedures. Little is known, however, about body image changes and associated features from pre-to post-bariatric surgery and subsequent body contouring. The objective of the present study was to conduct a comprehensive literature review of body image following bariatric surgery to help inform future clinical research and care. The articles for the current review were identified by searching PubMed and SCOPUS and references from relevant articles. A total of 60 articles examining body image post-bariatric surgery were identified and 45 did not include body contouring surgery. Overall, there was great variation in standards of reporting sample characteristics and body image terms. When examining broad levels of body image dissatisfaction, the literature suggests general improvements in certain aspects of body image following bariatric surgery; however, few studies have systematically examined various body image domains from pre-to post-bariatric surgery and subsequent body contouring surgery. In conclusion, there is a paucity of research that examines the *multidimensional* elements of body image following bariatric surgery.

Keywords

Obesity; Bariatric Surgery; Body Image; Body Dissatisfaction; Body Contouring Surgery

Introduction

“My abdomen was like a part that didn’t belong to me and now it’s all part of me again.”
(bariatric surgery patient who subsequently underwent body contouring surgery ¹, p.548)

Bariatric surgery is the most effective available treatment for severe obesity producing substantial weight losses that are reasonably sustained over time along with significant improvements in obesity-related medical comorbidities (e.g., diabetes, hypertension) and mortality rates ². Research has also found that bariatric surgery is associated with broad

improvements in psychosocial functioning over time although there appears to be considerable heterogeneity in the benefits over time across different domains^{3,4}.

The present review focuses on the effects of bariatric surgery on body image. Body image is a multidimensional construct⁵ consisting of cognitive, affective, behavioral, and perceptual aspects⁶. Various forms of body image dissatisfaction are linked to a host of diverse psychosocial sequelae and areas of impaired functioning including, for example, binge eating, depression, social anxiety, and poorer physical health-related quality of life^{7,8}. Among individuals seeking bariatric surgery, aspects of body image dissatisfaction are associated with binge eating, depression, and lower self-esteem⁹. Thus, it is not surprising that approximately 1 in 5 bariatric surgery patients have identified appearance concerns as the primary motivator for surgery¹⁰. While the weight loss and metabolic outcomes of various bariatric surgeries have been well-documented, the complexities of body image post-operatively remain poorly understood.

Another related aspect of body image that requires careful review among bariatric surgery patients involves the issue of excess skin following massive weight loss, which appears to be both very common¹¹⁻¹³ and quite troublesome¹⁴. Excess skin has been linked to dermatitis and itching,¹² difficulty exercising¹², irritation in skin folds¹⁴, difficulty finding or fitting in clothes^{15,16}, intimate relationship distress¹⁵, and high levels of daily impairment¹⁴. Accordingly, some bariatric patients have elected to undergo body-contouring surgery (BCS) following bariatric surgery. As many as 84.5% of bariatric surgery patients desire subsequent BCS, with greater percentages for women than men, 75% compared to 68%, respectively¹². Despite the desire for BCS, the percentage of bariatric patients who actually undergo subsequent BCS is much lower, ranging from 21%¹¹ to 47%¹³, which may be due, in part, to financial barriers and lack of insurance coverage¹³. Little is known about the trajectory of body image concerns from pre- to post-bariatric surgery and with respect to BCS.

The aim of the present study was to conduct a comprehensive literature review of body image following bariatric surgery and subsequent BCS to help elucidate the findings from the current literature and to provide recommendations for future research in this area.

Method

The articles for the current review were identified by searching PubMed and SCOPUS and by searching references from relevant articles. Search terms included “bariatric surgery,” “gastric bypass,” “lap-band,” “Roux-en-Y,” and “sleeve gastrectomy,” coupled with body image terms such as “body image” and “body dissatisfaction.” PubMed and SCOPUS generated 321 and 281 articles, respectively. Studies were included if a body image measure was utilized in a post-bariatric surgery group. Both retrospective and prospective designs were included. Exclusion criteria included studies prior to 1991 (the National Institutes of Health distributed guidelines on the surgical management of obesity in 1991), non-English articles, case reports, qualitative studies (see Coulman et al.¹⁷), and articles focusing on only bariatric candidates without follow-up post-operative data. Additionally, studies focusing on generic level of satisfaction without a specific body image measure were excluded. Author 1 searched and screened articles. Both authors 1 and 2 reviewed all relevant articles and met to

discuss articles. When an aspect of a study was unclear (i.e., sample characteristics or body image measure), a collaborative decision was made by both authors^{18, 19}. Refer to the PRISMA Flow Diagram²⁰ (Figure 1) for a visual depiction of the inclusion/exclusion process. The original search ended on April 13, 2017.

Results

A total of 60 articles examining body image post-bariatric surgery were identified. Of these, 18 (30.0%) were cross-sectional, 38 (63.3%) were observational longitudinal, two (3.3%) were scale development^{21, 22}, and one study was a treatment outcome study (published as two articles; one with pre- to post-data²³ and one with follow-up data through six months post-treatment²⁴). All but two studies^{25, 26} examined adults, the majority of which included female participants. Overall, there was great variation in standards of reporting sample characteristics. A total of 22 (36.7%) studies had a sample size of at least 100 participants, while 27 (45.0%) had a sample size of less than 50 participants. According to the Oxford Centre for Evidence-Based Medicine ratings, the quality of the level of evidence was low, with a modal score of 4 (an average rating of 3.8) on a scale from 1 (highest quality) to 5 (lowest quality).

The remainder of this section will first summarize the results of studies examining body image after bariatric surgery *without* BCS, followed by a summary of studies examining body image among individuals who had bariatric surgery and sought or underwent subsequent BCS.

Studies examining body image following bariatric surgery (without BCS)

A total of 45 articles were classified as examining body image post-bariatric surgery without BCS. Table 1 lists the study, study design and timeframe, sample characteristics, bariatric surgery type, body image measures, and summary of the relevant body image findings for these studies. Of these 45 articles, 12 were cross-sectional and 33 were longitudinal designs; only two^{23, 24} of which reported findings from a pilot randomized clinical trial. Among the 12 cross-sectional studies, time since surgery ranged from 1–3 weeks²⁷ to 10 years post-surgery²⁸. Of the 31 observational longitudinal studies, follow-up periods ranged from 5 months to “48 or more” months post-bariatric surgery; however, 41.9% (n=13)^{25, 29–40} and 45.2% (n=14)^{3, 26, 41–52} of these studies included follow-up assessments through 12 and 24 months post-bariatric surgery, respectively. One study was a small treatment outcome study (n=39 randomized patients) comparing acceptance and behavioral therapy to treatment-as-usual after six weeks of treatment²³ and after a six-month follow-up period²⁴.

A total of 18 different body image measures were identified throughout this literature and none were validated specifically among post-operative bariatric surgery patients. Overall, body image was examined with respect to pre- to post-operative changes and clinical correlates. Based on the current conceptualization and various measurements of body image post-bariatric surgery, general improvements in body image were typically observed among adults^{3, 27, 29–32, 34–39, 42–48, 50–58} and adolescents^{25, 26} after bariatric surgery; some studies, however, reported improvement in only some specific body image domains but not others^{33, 41, 42, 58}. For example, de Panfilis et al.³³ found that fear of being fat, feelings of

detachment from one's body, and uneasiness towards particular body parts did not improve post-surgery. Six studies^{31, 37, 42–44, 46} which reported whether post-operative body image scores were comparable to “norms”, which varied by study (i.e., women with average BMI's in the “normal” range or the “general population”), yielded mixed findings. Taken together, these results suggest that while certain body image improvements are observed post-surgery, these improvements may not necessarily reach norms.

In addition to examining changes in body image, 17 studies^{28, 31, 33, 34, 37, 39, 42, 43, 45, 48, 49, 52, 53, 56, 57, 59, 60} examined the relationship between post-operative body image and weight. Nearly half of these 17 studies (41.2%) reported a relationship between greater weight loss and improvements in body image^{28, 34, 43, 48, 53, 57, 59}. In contrast, one study⁴⁹ found an association between greater post-operative body *dissatisfaction* and greater weight loss. Sarwer et al.⁴⁷ reported that greater weight loss was related to improvements in body image quality of life, but not general weight and shape concerns, while Dixon et al.⁴² found that appearance evaluation, but not appearance orientation was related to BMI. Seven studies^{31, 33, 37, 39, 52, 56, 60} did not find an association between body image scores and BMI or weight changes following surgery. Taken together, the literature on post-operative body image changes and weight outcomes is mixed.

Eight studies^{32–34, 47, 58, 61–63} examined body image in relation to eating behaviors post-bariatric surgery, including loss of control eating^{47, 62} or “uncontrolled eating”³⁴, binge eating^{33, 61}, and night eating⁵⁸. Greater loss-of-control eating was associated with greater shape and weight concerns^{47, 63}, higher body shape scores pre- and post-operatively, and lower appearance orientation and appearance evaluation scores³⁴. De Panfilis et al.³³ reported a relationship between decreased binge eating and body image improvements. Similarly, two studies found that individuals with post-operative binge eating³² or binge eating disorder⁶¹ reported greater shape concerns than individuals without binge-eating behavior or binge eating disorder, respectively. Lastly, one study reported a trend for a link between night eating and negative components of body image⁵⁸.

Two studies^{30, 64} examined the relationship between post-operative body image and history of abuse. Both studies reported general body image improvements post-surgery; however, significant differences in body image scores did not emerge when comparing two groups (sexual abuse history vs. no sexual abuse history⁶⁴) or when comparing three groups (childhood sexual abuse, other maltreatment, and no maltreatment³⁰).

Three studies^{41, 57, 65} compared body image scores between bariatric patients and a control group. Adami et al.⁶⁵ compared three groups: post-bariatric patients, individuals with obesity without a history of bariatric surgery, and healthy subjects without obesity from a university setting. Overall, bariatric patients had lower body disparagement scores than individuals with obesity. Among bariatric patients with adult-onset obesity, some measures of body image were comparable to the healthy comparison group, while those with early-onset obesity had greater body dissatisfaction scores. In a longitudinal study, Adami et al.⁴¹ compared 30 bariatric patients and a control group matched for gender and age. Although

general body image improvements were observed among the bariatric surgery group, only some aspects of body image ratings were comparable to those of the control group.

Finally, one small treatment outcome study randomized post-operative bariatric surgery patients to either acceptance and commitment therapy or treatment-as-usual for disordered eating, body image, and quality of life. Body image was assessed before treatment, after six weeks of treatment²³, and six months following the end of treatment²⁴. The acceptance and commitment treatment group reported significant improvements in body image and weight concerns at the post and six-month follow-up assessments; while the treatment-as-usual group reported improvements in weight concerns from pre-treatment to the six-month follow-up.

Studies examining body image among bariatric surgery patients pre- or post-BCS

Table 2 summarizes the BCS literature, including study design and timeframe, sample characteristics, bariatric and BCS type, body image measures, and relevant findings. A total of 15 identified articles examined body image among post-bariatric adults pre- or post-BCS with a range of methodological designs. Six studies utilized a cross-sectional design, seven utilized a longitudinal design, and two involved scale development. Of the six cross-sectional studies, two studies consisted of post-bariatric surgery patients seeking BCS (n=35⁶⁶ and n=36⁶⁷), while four included post-BCS patients (n=10⁶⁸; n=10⁶⁹; n=20⁷⁰; and n=62⁷¹). Two of the cross-sectional studies^{69, 71} compared more than two study groups cross-sectionally (i.e., pre-bariatric surgery patients, post-bariatric surgery patients without BCS, and post bariatric surgery patients who underwent BCS⁷¹). A variety of bariatric surgery samples were studied with some studies including more than one bariatric surgery type^{67, 70, 71} and time since bariatric surgery ranged from 6–38.71 months. Of the seven longitudinal studies, BCS sample sizes were small, ranging from 18–47, and follow-up assessments ranged from three⁷² to 61 months (range: 32–83 months⁷³) months post-BCS. Three studies had a six-month follow-up assessment^{74–76} while two had a 12-month follow-up assessment^{77, 78}. A range of bariatric surgeries were reported in the longitudinal designs including a single bariatric surgery (i.e., gastric banding⁷⁸; biliopancreatic diversion⁷⁵; gastric bypass⁷⁷) or more than one bariatric surgery type^{72, 73, 76}. Several body contouring procedures following bariatric surgery were reported with abdominoplasty appearing to be the most common. Studies focusing on scale development^{21, 22} did not indicate bariatric or BCS type.

Outside the two scale development studies^{21, 22}, over 10 different types of body image measures were used, none of which were psychometrically validated among bariatric surgery patients. Two new body image measures, the Body-QOL and the Body-Q were developed specifically for BCS patients. The Body-QOL (20-items) focuses on body image in several domains including satisfaction, sex life, self-esteem, social performance, and physical symptoms, while the Body-Q (148-items) assesses body image features in addition to other domains (i.e., treatment by medical staff).

Across the varied body image measures, individuals with a history of bariatric surgery seeking BCS reported higher body image dissatisfaction than the general population⁶⁶ and a non-surgical control group matched on BMI and demographic variables⁶⁷. Individuals who

underwent BCS reported improvements in various body image indices compared to post-bariatric patients who did not undergo BCS^{68–70, 74, 76–78} including improvements in appearance evaluation, body area satisfaction, and physical functioning, even after adjusting for weight loss and time since surgery⁷¹. Despite undergoing BCS, however, some patients still report dissatisfaction following BCS⁷¹. For example, 27.2% (n=15) continued to report feeling “very dissatisfied to dissatisfied” following abdominoplasty and 40% (n=6) reported feeling “very dissatisfied or dissatisfied” following a thigh lift. Interestingly, none reported dissatisfaction following breast lift (n=10). In addition, patients reported continued dissatisfaction related to non-contoured areas⁷⁴. Accordingly, one study found that 23.5% of BCS patients with a history of bariatric surgery underwent a second BCS operation for another area by the second follow-up of the study and all recommended BCS following bariatric surgery⁷⁸. When using a well-established body image measure that captures several body image domains (the MBSRQ), only a few body image indices significantly improved among post-BCS patients, namely appearance evaluation, body area satisfaction, and self-classified weight domains, based on both cross-sectional⁷¹ and longitudinal⁷⁷ designs. Thus, it may be that certain aspects of body image improve following BCS while others do not. Evidence from one longitudinal study also suggests that body image scores are comparable to norms after three or more BCS procedures are performed or following mastopexy⁷⁵.

Discussion

This review systematically examined research on body image following bariatric surgery. Overall, findings from both cross-sectional and longitudinal studies suggest general improvements in body image occur following bariatric surgery. Some studies, however, suggest that certain aspects of body image do not improve post-operatively or do not reach norms. Of note, the majority of studies did not investigate concerns related to excess skin and BCS following bariatric surgery. In addition, eating pathology, such as binge eating, night eating, and loss of control eating, appears to be related to greater body image dissatisfaction post-surgery. The literature is mixed regarding the relationship between weight outcomes and changes in body image. The mixed literature may perhaps be related to methodologic factors including, for example, the variety of body image measures used which tap different aspects of body image (i.e., cognitive, affective, behavioral, or perceptual aspects). It may be that only certain aspects of body image (i.e., body dissatisfaction, body distortion, or body disparagement) generally improve post-surgically.

Discrepant body image findings may also be related to concerns regarding excess skin following substantial weight loss. Despite the high rates of excess skin and associated concerns, very few studies examined body image and excess skin concerns following bariatric surgery and subsequent BCS. The types of BCS were quite varied, with body contouring in the abdominal region being the most common procedure performed. Greater attention to body image concerns related to excess skin and BCS following bariatric surgery is needed. Overall, it appears that BCS helps improve body image for the specific targeted regions, but not necessarily other regions.

It is also important to note that very little is known about adolescent body image following bariatric surgery. Two small studies found clinically significant body image improvements within the first post-operative year^{25, 26}. Further longitudinal research is needed to better understand the durability of these improvements over time, particularly considering that adolescence is a prime time to develop body image concerns and related eating-disorder psychopathology. Lastly, excess skin concerns and desire for BCS among adolescents are still unknown.

Overall, these results need to be considered cautiously given that the data comprising this literature represents low-level evidence. There was great variation in standards of reporting (i.e., demographic and weight variables) and small sample sizes. For example, nearly half of the studies had a post-operative sample size of less than 50. Approximately half of the cross-sectional and longitudinal studies did not report response rates and retention rates, respectively. Of those that reported retention, retention rates varied considerably across different studies, underscoring relatively high attrition, albeit a few notable exceptions with good retention at least through the earlier follow-up points^{3, 26, 45, 50, 51}.

Based on conducting this systematic review, we offer several recommendations for future research in this area. First, prospective studies of adolescents and adults are warranted to determine the durability of body image improvements over time. Most studies assessed patients through the first two years post-bariatric surgery and few studies prospectively measured body image following bariatric surgery and subsequent BCS. In addition, prospective studies may help elucidate the relationship between various body image indices, weight outcomes, and associated clinical features. Second, the next generation of research in this area should be conducted with greater methodological rigor and precision when reporting sample characteristics, such as race and BMI over time, and retention/attrition rates. There was tremendous variation in standards and ways of reporting, making direct comparisons difficult. Third, the majority of studies focused on primarily White women and future research with more diverse groups is needed to examine potential sex, ethnic, and racial differences. The mixed findings may be due, in part, to combining various groups (i.e., men and women, or individuals from different racial or ethnic backgrounds). In fact, none of the studies examined sex and racial differences in body image following bariatric surgery. Additionally, it will be important to investigate potential cross-cultural and geographic variations in body image concerns post-bariatric surgery to elucidate the needs of diverse groups. Fourth, more sophisticated analyses should be conducted to better understand the relationships among eating, body image, and weight loss in this group. Moreover, such analyses may help detect protective factors related to body image changes over time. Fifth, operationally defining the body image construct measured (i.e., body dissatisfaction, body distortion, etc.) and developing appropriate, tailored measures specific to the unique needs of this population (i.e., related to excess skin), as opposed to general satisfaction measures or body image measures created for eating disorder populations, may aid in our understanding of the complexity of body image changes following bariatric surgery. Finally, rigorous research and high-level data in this area may help inform insurance policy coverage for subsequent body contouring procedures following bariatric surgery.

Clinically, we offer the following recommendations. Given the low-level evidence for body image improvements following bariatric surgery, coupled with patients' desire for subsequent body contouring procedures, we encourage targeted psychoeducation and assessment of body image concerns throughout the bariatric surgery process, both before and after bariatric surgery. Psychoeducation should consist of realistic expectations regarding weight loss⁷⁹, potential changes in body shape, body contouring options, and potential barriers to BCS. In addition, assessment of various components of body image concerns should be monitored over time. As observed in non-surgical populations⁶, various features of body image dissatisfaction may be a signal for greater eating-disorder psychopathology, which could ultimately impact long-term weight loss outcomes following bariatric surgery³.

In conclusion, this review highlights the need for more rigorous research to better understand the complexities of body image following bariatric surgery and BCS. There is a paucity of research that examines the *multidimensional* elements of body image following bariatric surgery, particularly related to excess skin and subsequent body contouring procedures. Despite reports indicating general improvements in body image following bariatric surgery, careful examination of the literature indicates a much more complex and varied picture related to excess skin, body contouring surgery, and various body image indices. The next wave of body image research in this area should identify which BCS interventions and for whom (which patients) produce the most benefit following bariatric surgery.

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Abbreviations

BCS	Body Contouring Surgery
BMI	Body Mass Index
QOL	Quality of Life
MBSRQ	Multidimensional Body-Self Relations Questionnaire

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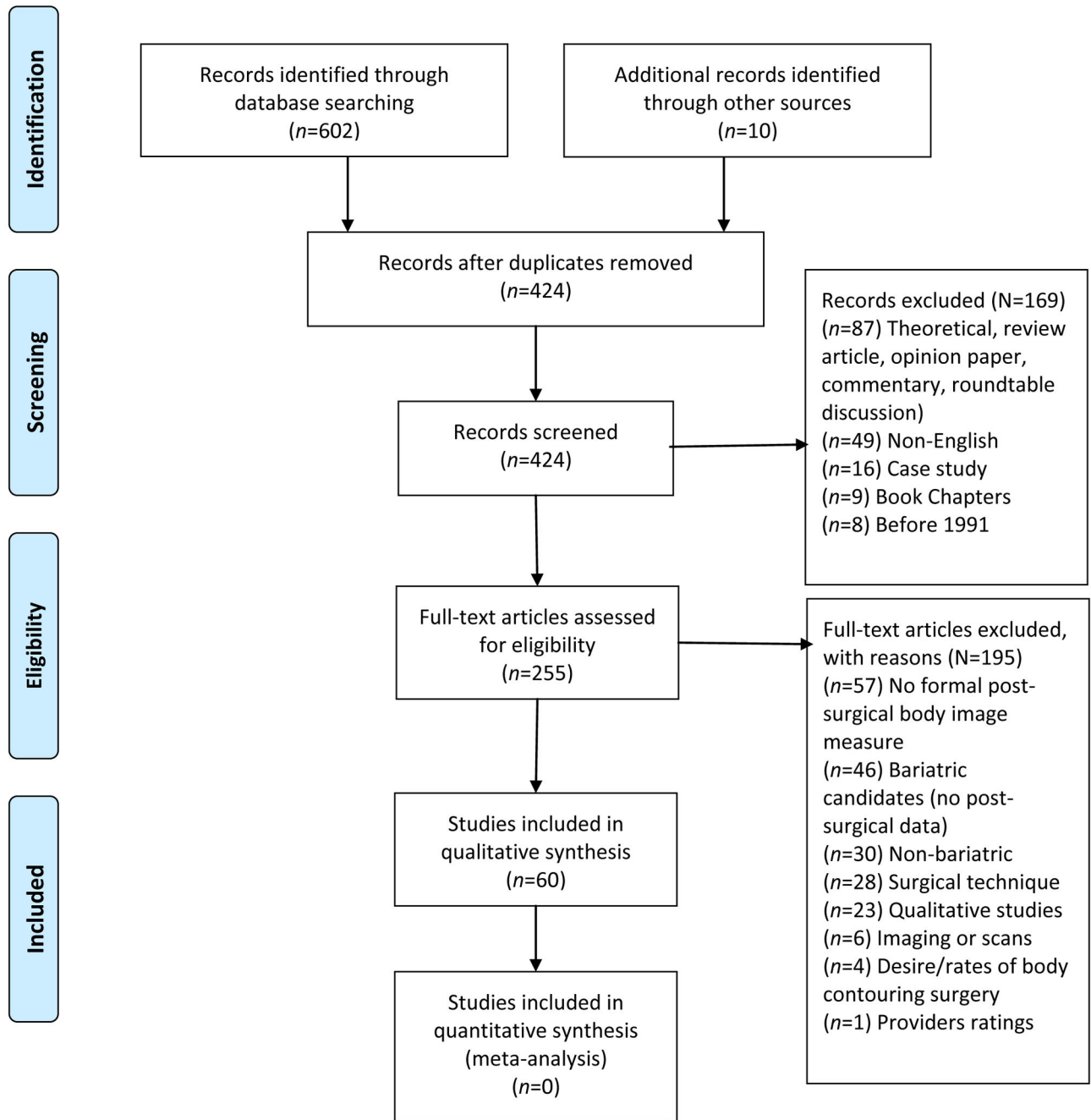
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Prisma 2009 Flow Diagram

Table 1.

Summary of articles reporting body image results following bariatric surgery

Study (ref) by Design and Year	Study Design Timeframe	Sample Characteristics Gender: n or % Race: n or % Age: Mean±SD years Post-WLS BMI: Mean±SD kg/m ²	WLS Type ^a · n included if > 1 WLS	Body Image Measures · Subscales	Summary of Relevant Body Image Findings Response Rate (cross-sectional design) or Retention Rate (longitudinal design)
Adami (1998)	Cross-sectional 3 groups 1. Obesity without WLS 2. Post-WLS · 24-158 months (M:35 months) 3. University healthy without obesity (control)	N=47-131 Obesity without WLS n=110 Post-WLS n=131 Without Obesity n=47 Gender: Overall NI Race: NI Age range: 17-63 Post-WLS BMI: Overall NI BMI by post-WLS groups ranged from 27.9-28.2	Biliopancreatic diversion	BAQ BSQ EDI: · BD	Body image findings presented by groups: · Adult-onset obesity vs. early-onset obesity vs. control Post-WLS group had similar BAQ attractiveness scores as control without obesity and lower BAQ disparegament scores than non-WLS obesity group. Post-WLS patients with adult-onset obesity reported similar BAQ, BSQ, and BD scores as control group. Post-WLS patients with early-onset obesity reported lower BSQ scores than non-WLS obesity group and higher BSQ scores than control group without obesity. Response rate: NI
Guisado (2002)	Cross-sectional · 18 months post-WLS	N=100 Gender: Female=85 Male=15 Race: NI Age: 40.50±11.15 Post-WLS BMI: 33.49±6.31	Vertical banded gastroplasty	EDI	Body image findings presented by weight loss groups: · Weight loss >30% (n=56) vs. Weight loss <30% (n=44) Weight loss >30% had lower body dissatisfaction, drive for thinness, and global EDI scores than weight loss <30%. Response rate: NI
Neven (2002)	Cross-sectional 4 groups 1. Pre-WLS Post-WLS: 2. 1-3 weeks 3. 6 months 4. 12 months	N=14-24 Pre-WLS n=20 1-3 weeks post n=14 6 month post n=24 12 month post n=20 Gender: NI Race: NI Age: Total age NI; Age by group ranged from 37.9±8.5 to 41.2±8.9 Post-WLS BMI: Overall NI BMI by group ranged from 53.8±10.9 to 58.6±13.2	Bypass	MBSRQ: · AE FRS	MBSRQ AE: Significant improvement in perceptions of body image post-surgery, particularly between pre-WLS and 6 months post-WLS. There was also a significant change in body image between 6 and 12 months post-WLS. FRS: The ideal silhouette figure did not change; however, the differences between the current and ideal image was smaller at 6 and 12 months post-WLS. Response rate: NI
Hotter (2003)	Cross-sectional · 12.5±4.6 months post-WLS	N=77 Gender: Female=65 Male=12 Race: NI Age: 40.1±9.9	Band	BIQ-20: German version FBek: German version	Body image findings presented by groups: · 'Good outcome group' vs. 'Poor outcome group' 'Good outcome group' had improvements on BIQ-20 and FBek subscales.

Study (ref) by Design and Year	Study Design Timeframe	Sample Characteristics Gender: n or % Race: n or % Age: Mean±SD years Post-WLS BMI: Mean±SD kg/m ²	WLS Type ^a · n included if > 1 WLS	Body Image Measures · Subscales	Summary of Relevant Body Image Findings Response Rate (cross-sectional design) or Retention Rate (longitudinal design)
		Post-WLS BMI: 30.8±6.1			Poor outcome group had poorer body image on various aspects of body image including body disparagement, low levels of self-efficacy, and bodily control. Response rate: 67%
Madan (2008)	Cross-sectional 2 groups 1. Pre-WLS 2. Post-WLS · Time since surgery: NI	N=27 Pre-WLS n=8 Post WLS n=19 Gender: NI Race: NI Age: NI Post-WLS BMI: 33±10	Bypass: · n=15 Band: · n=12	BESAA	Post-WLS group reported better body image than pre-WLS group. Response rate: NI
Buser (2009)	Cross-sectional · 6-18 or 19-40 months post-WLS	N=106 Gender: Female=106 Male=0 Race: NI Age: NI Post-WLS BMI: Overall NI BMI by groups ranged from 27.01±4.29 to 34.54±8.16	Bypass	BISS	Body image findings presented by groups: · History of sexual abuse versus no history sexual abuse No significant differences in body dissatisfaction between the two groups at 6-18 months or 19-40 months post-WLS. Response rate: Overall, NI. Of the N=136 who agreed to participate, 112/136 (82.4%) provided usable data.
Larsen (2009)	Cross-sectional · 42.6-46.0 months post-WLS	N=34 BED n=16 Non-BED n=18 Gender: Female=34 Male=0 Race: NI Age: Overall age NI. Age by groups ranged from 38.4±7.6 to 42.7±6.5 Post-WLS BMI: Overall NI. BMI ranged from 35.8±6.0 to 40.1±8.2. Matched on demographic variables	Band	EDE: · WC · SC	Body image findings presented by groups: · BED versus non-BED groups post-WLS BED group had higher shape concern, eating concern, and restraint compared to non-BED following bariatric surgery, signifying large effect sizes. The two groups did not differ on weight concerns. Response rate: 68%
Kinzl (2011)	Cross-sectional · 10 years post-WLS	N=112 Gender: Female=92 Male=20 Race: NI Age: 49 Post-WLS BMI: 31.1	Band	BIQ; German version is FKB-20	Those satisfied with weight loss reported statistically significantly less rejection of their body and greater vital body dynamics. Greater excess weight loss was negatively correlated with rejecting body assessment and positively correlated with greater vital body dynamics. Response rate: 62.2%
Conceicao (2014)	Cross-sectional 3 groups: 1. Pre-WLS	N=339 Pre-WLS group: n=176 Post-WLS groups: Sleeve gastrectomy: · n=12	Band: · n=95 Sleeve gastrectomy: · n=12	BSQ; Portuguese version	Body image findings presented by groups: · Loss-of-control eating versus not

Study (ref) by Design and Year	Study Design Timeframe	Sample Characteristics Gender: n or % Race: n or % Age: Mean±SD years Post-WLS BMI: Mean±SD kg/m ²	WLS Type ^a · n included if > 1 WLS	Body Image Measures · Subscales	Summary of Relevant Body Image Findings Response Rate (cross-sectional design) or Retention Rate (longitudinal design)
	Post-WLS 2. Within 24 Months · 11.4±4.0 months post-WLS 3. >24 Months · 55.8±34.4 months post-WLS	· Within 24 months: n=110 · >24 months: n=53 Gender: Female: Overall NI, 88.1% -89.0% by groups Race: NI Age: Overall age NI, Age by groups ranged from 41.7±10.8 to 43.5±10.9 Post-WLS BMI: Overall NI, BMI ranged from 30.0±4.6 to 37.6±6.1.	Bypass: · n=61		Loss-of-control eating group reported significantly greater BSQ scores at pre-WLS and the >24 months post-WLS phases than did the group without loss-of-control eating. Response rate: Pre-WLS=65%, Post-WLS: 90%
Mirijello (2015)	Cross-sectional · 2-218 months post-WLS (M:44 months)	N=46 1. Pre-WLS group: n=20 2. Post-WLS group: n=26 3. Control group: n=50 Gender (Surgical): Females=32 Males=14 Race: NI Age: 42.5±10.9 Post-WLS BMI: 34.6±6.9 Control group matched on gender, age, residence, employment, and socio-economic status	Biliopancreatic diversion	BSQ	Pre-WLS group had greater distress about body shape than post-WLS group. BSQ scores were significantly correlated with BMI and weight. There was an inverse correlation between change in BMI and BSQ. Response rate: 76.7%
Ramalho (2015)	Cross-sectional · 19.0±10 months post-WLS	N=61 Gender: Females=61 Male=0 Race: NI Age: 41.3±8.7 Post-WLS BMI: 30.45±5.35	Bypass: · n=42 Band: · n=17 Sleeve gastrectomy: · n=2	BSQ Excessive skin impairment survey	Greater concerns with BSQ weight and shape was associated with greater impairment due to excessive skin. Concerns with body image negatively correlated with all sexual functioning domains, except pain during intercourse, and with greater depressive symptoms. Women with sexual dysfunction reported greater concerns with BSQ weight and shape. Excessive skin impairment was not correlated with %TWL. Response rate: 54.5%
Ivezaj (2017)	Cross-sectional · 6 months post-WLS	N=71 Gender: Females=60 Males=11 Race: White=39 Black=22 Hispanic=9 Other=1	Sleeve gastrectomy	EDE-BSV: · WC · SC	Body image findings presented by groups: · Bariatric-BED (Bar-BED) vs not Bar-BED Bar-BED group had significantly greater EDE weight and shape concerns than the non-Bar-BED group. Lifetime history of BED was associated with greater EDE weight and shape concerns than no lifetime BED history. Response rate: NI (treatment-seeking RCT)

Study (ref) by Design and Year	Study Design Timeframe	Sample Characteristics Gender: n or % Race: n or % Age: Mean±SD years Post-WLS BMI: Mean±SD kg/m ²	WLS Type ^a · n included if > 1 WLS	Body Image Measures · Subscales	Summary of Relevant Body Image Findings Response Rate (cross-sectional design) or Retention Rate (longitudinal design)
Adami (1999)	Longitudinal · Pre-WLS: · Baseline · Post-WLS: · 36 months	N=30 Gender: · Females=21 · Males=9 Race: NI Age: 36.8 Post-WLS BMI: 30.6±0.7 Control group: n=30 Control group matched on gender and age Control BMI: 23.4±0.4	Biliopancreatic diversion	BAQ BSQ EDI: · BD	EDI BD and BAQ's feeling fat, attractiveness, and body fatness scores were similar to controls without obesity 36 months post-WLS. Significant reductions in BSQ scores post-WLS, but higher than control group without obesity. Significant reductions in BAQ's disengagement and salience of shape post-WLS, but higher than control group without obesity. No change in BAQ strength and fitness post-WLS; these scores were similar to the control group. Retention: NI
Dixon (2002)	Longitudinal · Pre-WLS: · Baseline · Post-WLS: · 12 months · 24 months · 36 months · 48 or more	N=322 N=122 completed paired preoperative and 12 month post-operative surveys. Gender: · Female=274 · Men=48 Race: NI Age: 41±10 Post-WLS BMI: 32.9±6-35.1±6	Band	MBSRQ: · AE · AO	Mean MBSRQ AO scores did not differ post-WLS. No significant correlation between 12 month AO and BMI. Significant improvements in MBSRQ AE, but AE scores did not reach community norms. Improvements in MBSRQ AE was associated with greater improvement in mental measures of quality of life, lower BDI scores, and greater percent excess weight loss. Women, younger age, and lower BMI predicted the greatest discrepancy between MBSRQ AO and AE scores. Retention: 12 months: 64.9%, 24 months: 46.0%, 36 months: 24.8%, 48 months or more: 19.3%
Dixon (2003)	Longitudinal · Pre-WLS: · Baseline · Post-WLS: · 12 months	N=487 N=262 paired pre- and 1-year post-WLS Gender: · Female=85% · Male=15% Age: 41.2±9.7 Post-WLS BMI: 44.1±7.4	Band	MBSRQ: · AE · AO	Decreases in BDI were correlated with AE improvements. MBSRQ AO scores were higher for women than men. Women with severe obesity had significantly greater MBSRQ discrepancy (AO-AE) than men. Most women < 35 years old with a MBSRQ AE score < 1.6 (mean) had a Beck Depression Inventory score of 23 or greater, signifying major depressive symptoms. Retention: NI
Grilo (2006)	Longitudinal · Pre-WLS: · Baseline	N=137 Gender: · Female=122	Bypass	BSQ EDE-Q: · WC	Body image improvements observed from pre- to post-WLS. Body image findings presented by groups:

Study (ref) by Design and Year	Study Design Timeframe	Sample Characteristics Gender: n or % Race: n or % Age: Mean±SD years Post-WLS BMI: Mean±SD kg/m ²	WLS Type ^a · n included if > 1 WLS	Body Image Measures · Subscales	Summary of Relevant Body Image Findings Response Rate (cross-sectional design) or Retention Rate (longitudinal design)
	Post-WLS: · 12 months	Male=15 Race: White=97 African American=23 Hispanic American=15 Other=2 Age: 42.3±10.2 Post-WLS BMI: Overall NI. BMI by groups ranged from 32.51±5.04 to 33.77±6.03		· SC	· History of sexual abuse vs other maltreatment vs none Other maltreatment group had higher baseline BSQ and EDE-Q weight concern scores. Post-WLS, the three groups did not differ significantly on measures of body image. Retention: NI
Hrabosky (2006)	Longitudinal Pre-WLS: · Baseline Post-WLS: · 6 months · 12 months	N=109 Gender: Female=97 Male=12 Race: White=73 Black=20 Hispanic=15 Asian=1 Age: 42.5±10.4 Post-WLS BMI: 33.04±5.61	Bypass	BSQ EDE-Q: · WC · SC	Significant improvements observed in BSQ and EDE-Q subscales from pre- to 6 months post-WLS; EDE-Q weight concerns continued to improve at 12 months post-WLS. None of the three body image scales significantly predicted changes in BMI at 6 or 12 months post-WLS. Most reached body image norms 6 months post-WLS. At least 81% at 6 and 85% at 12 months reported clinically significant reductions in body dissatisfaction and concerns. Retention: NI
Masheb (2006)	Longitudinal Pre-WLS: · Baseline Post-WLS: · 6 months	N=145 Gender: Female=129 Males=16 Race: White=98 African American=25 Hispanic American=19 Age: 42.1±10.3 Post-WLS BMI: NI	Bypass	BSQ EDE-Q: · Over-valuation	Improvements were observed in overvaluation and body image dissatisfaction post-WLS. Body image dissatisfaction and overvaluation were significantly correlated at both assessments. Body image dissatisfaction was related to changes in self-esteem and negative affect and overvaluation was related to changes in self-esteem. Change in overvaluation was not related to change in BMI. Retention: NI
White (2006)	Longitudinal Pre-WLS: · Baseline Post-WLS: · 12 months	N=139 Gender: Female=124 Male=15 Race: White=98 African American: 23 Hispanic American: 16 Other: 2 Age: 42.4±10.2 Post-WLS BMI: Overall NI.	Bypass	BSQ EDE-Q: · WC · SC	Improved body image scores were observed post-WLS. Body image findings presented by pre-WLS groups: · Regular binge-eating episodes versus no binge episodes The regular binge-eating group reported statistically greater post-WLS EDE-Q SC scores than the no binge-eating group. Retention: NI

Study (ref) by Design and Year	Study Design Timeframe	Sample Characteristics Gender: n or % Race: n or % Age: Mean±SD years Post-WLS BMI: Mean±SD kg/m ²	WLS Type ^a · n included if > 1 WLS	Body Image Measures · Subscales	Summary of Relevant Body Image Findings Response Rate (cross-sectional design) or Retention Rate (longitudinal design)
De Panfilis (2007)	Longitudinal · Pre-WLS: · Baseline Post-WLS: · 12 months	N=35 Gender: Female=31 Males=4 Age: 41.2±8.3 years Post-WLS BMI: 37.8±5.5	Band	BUT	Overconcern with physical appearance, body image-related avoidance behaviors, rituals involving checking physical appearance, and body image dissatisfaction significantly decreased post-WLS. Weight phobia, feelings of detachment or estrangement from one's body, and uneasiness towards single body parts or functions did not change post-WLS. Less body image impairment was related to post-WLS reductions in binge-eating behaviors, after controlling for weight loss. Body image dissatisfaction was not related to weight loss. Retention: NI
Leombruni (2007)	Longitudinal · Pre-WLS: · Baseline Post-WLS: · 6 months	N=38 Gender: Female=32 Male=6 Race: NI Age: 39.80±9.92 Post-WLS BMI: 32.98±5.29	Vertical banded gastroplasty	BSQ EDI-2	Significantly lower BSQ and EDI-2 scores post-WLS. Greater EDI-2 body dissatisfaction was associated with greater weight loss. Retention: 73.1%
Colles (2008)	Longitudinal · Pre-WLS: · Baseline Post-WLS: · 12 months	N=129 Gender: Females=103 Males=26 Race: NI Age: 45.2±11.5 Post-WLS BMI: 35.0±6.0	Band	MBSRQ: · AD · AE · AO	MBSRQ AD and AE improved significantly. Body image findings presented by groups: · Post-WLS Uncontrolled eating vs not Uncontrolled eating group reported lower MBSRQ AO and AE scores than the group without uncontrolled eating. Higher MBSRQ AD predicted poorer percent weight loss. Retention: 65.9%; Paired data
Morrow (2008)	Longitudinal · Pre-WLS: · Baseline Post-WLS: · 2 months · 5 months	N=24 Gender: Female=22 Male=2 Race: NI Age: 18-52 Post-WLS BMI: 33.8±3.5	Bypass	FRS modified	Body image discrepancy ratings decreased significantly from baseline to 2 months and 5 months post-WLS. Body image distortion ratings increased significantly. Body image findings presented by groups: · Post-WLS Night Eating versus No Night Eating Trend for increases in body image distortion for the Night Eating group compared to the group without night eating. Retention: 33.3%

Study (ref) by Design and Year	Study Design Timeframe	Sample Characteristics Gender: n or % Race: n or % Age: Mean±SD years Post-WLS BMI: Mean±SD kg/m ²	WLS Type ^a · n included if > 1 WLS	Body Image Measures · Subscales	Summary of Relevant Body Image Findings Response Rate (cross-sectional design) or Retention Rate (longitudinal design)
van Hout (2008)	Longitudinal · Pre-WLS: · Baseline Post-WLS: · 6 months · 12 months · 24 months	N=104 Gender: · Female=91 · Male=13 Race: NI Age: 38.4±8.3 Post-WLS BMI: NI	Vertical banded gastroplasty	BAT	Significant decreases in BAT scores between pre-WLS and 6, 12, and 24 months post-WLS, but no significant changes between 6 and 12 months or 12 and 24 months. More positive body image related to lower BMI. Pre- and post-WLS body image did not reach norms. Retention: 79.4%
van Hout (2009)	Longitudinal · Pre-WLS: · Baseline Post-WLS: · 24 months	N=112 Gender: · Female=98 · Male=14 Race: NI Age: 38.8±8.3 Post-WLS BMI: 31.9±5.9	Vertical banded gastroplasty	BAT EDE-II	Post-WLS scores revealed improved body attitude. Scores were better than group of female weight watchers, but did not reach norms. Post N: 76.7%
Munoz (2010)	Longitudinal · Pre-WLS: · Baseline Post-WLS: · 12 months	N=57 Gender: · Female: 82% · Male: 18% Race: · White: 68% · African American: 21% · Hispanic: 11% Age: 39±4.3 Post-WLS BMI: 37.4	Bypass	FRS	Post-WLS, there was a significant decrease in perceived and ideal body shape, and discrepancy between the two. Participants selected smaller ideal body shapes over time, resulting in nearly one full decrease in body size at 12 months post-WLS. Retention: NI
Sarwer (2010)	Longitudinal · Pre-WLS: · Baseline Post-WLS: · 5 months · 10 months · 21 months	N=200 Gender: · Female=164 · Male=36 Race: · White: 87% · African American: 9% Age: 42.6±9.9 Post-WLS BMI: NI	Bypass	BIQOLI BSQ	Body image improvements were observed from pre-WLS to each post-WLS assessment. Body image changes was related to health quality of life. Greater weight loss was associated with significant improvements on BIQOLI, but not with changes in BSQ. Retention: 5 months: 99.0%, 10 months: 73.5%; 23 months: 56%
Thonney (2010)	Longitudinal · Pre-WLS: · Baseline Post-WLS: · 12 months · 24 months	N=43 Gender: · Female=43 · Male=0 Race: NI Age: 39.2±1.4 Post-WLS BMI: NI	Bypass	EDE-II	Statistically significant improvements in body image observed 12 months post-WLS. Body dissatisfaction normalized 24 months post-WLS. Retention: NI
White (2010)	Longitudinal · Pre-WLS: · Baseline	N=361 Gender: · Female=311	Bypass	EDE-Q · WC · SC	Improvements in EDE-Q WC and SC observed post-WLS. Body image findings presented by groups:

Study (ref) by Design and Year	Study Design Timeframe	Sample Characteristics Gender: n or % Race: n or % Age: Mean±SD years Post-WLS BMI: Mean±SD kg/m ²	WLS Type ^a · n included if > 1 WLS	Body Image Measures · Subscales	Summary of Relevant Body Image Findings Response Rate (cross-sectional design) or Retention Rate (longitudinal design)
Zeller (2011)	Post-WLS: · 6 months · 12 months · 24 months Longitudinal Pre-WLS: · Baseline Post-WLS: · 6 month · 12 month · 18 month · 24 month	Male=50 Race: White=294, Black=33, Hispanic-American=26, Other/Missing=8 Age: 43.7±10.0 Post-WLS BMI: Overall NI	Bypass	IWQOL-K · Body esteem	· Loss-of-control eating vs no loss-of-control eating Loss-of-control eating group had greater EDE-Q WC and SC than those without loss-of-control eating post-WLS. Retention: 6 months: 86.1%, 12 months: 86.1%; 24 months: 47.4%
Ortega (2012)	Longitudinal Pre-WLS: · Baseline Post-WLS: · 6 months · 12 months	N=60 Gender: Female=46 Male=14 Race: NI Age: 44.05±10.86 Post-WLS BMI: 29.9±4.8	Bypass	BSQ Spanish version	Clinically significant improvements from pre-WLS to 6 months post-WLS, and from 6 to 12 months post-WLS. Body image scores from 12 months onwards were not significantly different. Retention: 6 months: 87.5%, 12 months: 93.8%, 18 months: 93.8%; 24 months: 87.5%
Ratcliff (2012)	Longitudinal Pre-WLS: · Baseline Post-WLS: · 6 months · 12 months	N=16 adolescents Gender: Female: 69% Male: 31% Race: White: 75% Age: 16.3±1.2 years Post-WLS BMI: 41.11±9.62	Bypass	IWQOL-K · Body esteem Stunkard FRS: · Discrepancy	Body improvements observed post-WLS. Greater post-WLS body image dissatisfaction was related to greater psychological discomfort 12 months post-WLS. Retention: NI
Teufel (2012)	Longitudinal Pre-WLS: · Baseline Post-WLS: · 12 months	N=51 Gender: Female=33 Male=18 Race: White=51 Age: 43.76±9.14 Post-WLS BMI: NI	Sleeve gastrectomy	BIQ-20: German version	Reduced body image discrepancy during first 12 months post-WLS, with the most reduction during first six months. No significant association between current body size estimation and attitudinal body image measures. Body image discrepancy was related to attitudinal body image dissatisfaction and weight-related quality of life. Percent excess weight loss was not related to body image discrepancy or IWQOL-K body esteem. Retention: 88%
					Improvements were observed in body image, self-evaluation of the body, and perceptions of body dynamics 12 months post-WLS, but did not reach norms. No sex differences in body image pre- or post-WLS. Body image was not related to weight or negative affect. Retention: 82.3%

Study (ref) by Design and Year	Study Design Timeframe	Sample Characteristics Gender: n or % Race: n or % Age: Mean±SD years Post-WLS BMI: Mean±SD kg/m ²	WLS Type ^a · n included if > 1 WLS	Body Image Measures · Subscales	Summary of Relevant Body Image Findings Response Rate (cross-sectional design) or Retention Rate (longitudinal design)
Lanza (2013)	Longitudinal Pre-WLS: · Baseline Post-WLS: · 36 months	N=98 Gender: · Female=98 · Male=0 Race: NI Age: 38.5±9.0 Post-WLS BMI: 31.0±7.8	Bypass	EDI-2	Body dissatisfaction improved three years post-WLS. Negative relationship between body dissatisfaction and excess weight loss. Retention: 59.2%
Gordon (2014)	Longitudinal Pre-WLS: · Baseline Post-WLS: · 6 months · 12 months · 24 months · Last clinical Observation (44.4±19.7 months)	N=333 Gender: · Female=282 · Male=51 Age: 35.4±9.5 Post-WLS BMI: NI	Bypass	BSQ: Brazilian version	Higher body image dissatisfaction positively correlated with weight loss at 24 months post-WLS. Lower BSQ scores were correlated with lower percent excess weight loss at 24 months and the last observation. On the last clinical observation after two years, body shape dissatisfaction remained an independent predictor of greater percent excess weight loss. Retention: 6 months: 85.9%, 12 months: 73%, 24 months: 45.3%, Last clinical observation: 67.9%
Matini (2014)	Longitudinal Pre-WLS: · Baseline Post-WLS: · 6 months	N=67 Gender: · Female=63 · Male=4 Age: 36.8±8.5 BMI: 48.8±4.7 Post-WLS BMI: 35.7±3.9	Bypass	EDI-3 · Drive for thinness · Bulimia · BD	Post-WLS, significant reductions in EDI drive for thinness, bulimia, and body dissatisfaction subscales were observed. No significant relationship between these subscales and weight loss six months post-WLS. Retention: NI
Melero (2014)	Longitudinal Pre-WLS: · Baseline Post-WLS: · 12 months	N=46 Gender: · Female=36 · Male=10 Race: NI Age: 37 Post-WLS BMI: 29±3	Vertical laparoscopic gastrectomy	BSQ EDI-1	Post-WLS, significant improvements in BSQ body concerns and EDI-1 body dissatisfaction. Retention: NI
Neff (2014)	Longitudinal Pre-WLS: · Baseline Post-WLS: · 12 months	N=217 Gender: · Female=174 · Male=43 Race: NI Age: Overall NI. Age by surgical type was 49±11 and 44±13 Post-WLS BMI: NI	Bypass: · n=148 Band: · n=69	King's Obesity Staging System BI	Body image improved after RYGB, but not band. Body image scores were not associated with change in BMI. When examining paired comparisons, body image did not differ by surgical procedure. Retention: NI
Sarwer (2014)	Longitudinal Pre-WLS:	N=106 Gender:	Bypass: · n=85 Band:	BQLI BSQ	Women reported significant improvements in body image at 12 and 24 months post-WLS.

Study (ref) by Design and Year	Study Design Timeframe	Sample Characteristics Gender: n or % Race: n or % Age: Mean±SD years Post-WLS BMI: Mean±SD kg/m ²	WLS Type ^a · n included if > 1 WLS	Body Image Measures · Subscales	Summary of Relevant Body Image Findings Response Rate (cross-sectional design) or Retention Rate (longitudinal design)
	· Baseline Post-WLS: · 12 months · 24 months	Female=106 Male=0 Race: White=102; Black=3 Other=1; Hispanic=1 Age: Median=41 Post-WLS BMI: NI	· n=21		Retention: 84.0% for both follow-ups
Sarwer (2015)	Longitudinal Pre-WLS: · Baseline Post-WLS: · 12 months · 24 months · 36 months · 48 months	N=32 Gender: Female=0 Male=32 Race: White=32 Hispanic=1 Age: Median=48 Post-WLS BMI: NI	Bypass	BIQLI BSQ	Men reported significant improvements in body image for both measures at each post-WLS assessment compared to pre-WLS. Retention: 87.5% for all follow-ups
Devlin (2016)	Longitudinal Pre-WLS: · Baseline Post-WLS: · 12 months · 24 months · 36 months	N=183 Gender: Female=152 Male=31 Race: White=169; Black=12 Multi-race=1; Hispanic=8 Age: Median=46.0 Post-WLS BMI: NI	Bypass: · n=111 Band · n=72	EDE-BSV · WC · SC	EDE-BSV weight and shape concerns were significantly lower at 12 and 36 months post-WLS compared to pre-WLS. Retention: 12 months: 85%, 24 months: 78%; 36 months: 67%
Wimmelmann (2016)	Longitudinal Pre-WLS: · Before diet-induced weight loss · Two months post diet Post-WLS: · 4 months · 18 months	N=40 Gender: Female=28 Male=12 Age: 39.5±8.9 Post-WLS BMI: NI 14 had diabetes	Bypass	Body Image Questionnaire	Weight-related body image scores improved significantly at 4 and 18 months post-WLS. Women had lower (worse) body image scores than men. Physical fitness did not make modest contributions to variations in weight-related body image. Body image findings presented by groups: · Diabetes versus no diabetes No significant main or interaction effects of diabetes for the weight-related body image subscale post-WLS. Retention: 4 months: 77.5%, 18 months: 57.5%
Nickel (2017)	Longitudinal Pre-WLS: · Baseline Post-WLS: · 6 months · 24 months	N=41 Gender: Female=17 Male=13 Race: NI Age: 42.9±12.4 Post-WLS BMI: 33.0±6.3	Bypass: · n=14 Sleeve gastrectomy: · n=16	BIQ · Body Image · Cosmetic · Self-confidence	Body image improved significantly at 6 and 24 months. No difference in BIQ body image, cosmetic results, or self-confidence between 6 and 24 months post-WLS. Significant correlation between post-WLS body image and mental health functioning.

Study (ref) by Design and Year	Study Design Timeframe	Sample Characteristics Gender: n or % Race: n or % Age: Mean±SD years Post-WLS BMI: Mean±SD kg/m ²	WLS Type ^a · n included if > 1 WLS	Body Image Measures · Subscales	Summary of Relevant Body Image Findings Response Rate (cross-sectional design) or Retention Rate (longitudinal design)
Weinland (2012) ^{a,b}	Treatment Outcome · 4-38 months Post-WLS M: 15.46 months · Baseline: pre-treatment · 6-week treatment · 6-month follow-up assessment	N=39 Gender: Female=35 Male=4 Race: NI Age: 43.08 Post-WLS BMI: 27.19	Sleeve gastrectomy: · n=25 Bypass: · n=14	BSQ: Short version EDE-Q: · WC · SC	No significant correlation between body image and BMI or percent excess weight loss. Retention: 73.2% Significant effect between group and time at post-treatment for EDE-Q weight and shape concerns with medium effect for weight concerns and large effect for shape concerns at post-treatment. Significant interaction effect between time and treatment for BSQ with medium effect size at post- and 6 months. Treatment group had large and significant improvements in BSQ and EDE-Q WC and SC from pre- to post and follow-up assessment. Retention ACT: Post: 78.9%, Follow-up: 63.2% Retention TAU: Post: 94.7%, Follow-up: 85.0%

Note.

^a“Bypass” includes papers describing gastric bypass and Roux-en-Y gastric bypass; “Band” includes papers describing various forms of adjustable banding procedures; AD=Appearance Dissatisfaction; AE=Appearance Evaluation; AO=Appearance Orientation; BAQ=Body Attitude Questionnaire; BAT=Body Attitude Test; BD=Body Dissatisfaction; BESSA=Body-Esteem Scale for Adolescents and Adults; BIQ=Body Image Questionnaire; BIQOL=Body Image Quality of Life Inventory; BISS=Body Mass Index; BSQ=Body Shape Questionnaire; BUT=Body Uneasiness Test; EDE=Eating Disorders Examination; EDE-Q=Eating Disorders Examination-Questionnaire; EDI=Eating Disorder Inventory; FRS=Figure Rating Scale; IWQOL-K=Impact of Weight on Quality of Life-Kids; MBSRQ=Multidimensional Body-Self Relations Questionnaire; NI=Not Indicated; SC=Shape Concern; WC=Weight Concern; WLS=Weight Loss Surgery

Table 2.

Summary of articles reporting body image results among bariatric surgery patients before or after body contouring surgery

Study (ref) by Design and Year	Study Design Timeframe Group Description (if indicated)	Sample Characteristics Gender: n or % Race: n or % Age: Mean±SD years Post-WLS BMI: Mean±SD kg/m ²	WLS type ^a · n included if > 1 procedure BCS type	Body Image Measures ·Subscales	Summary of Relevant Body Image Findings Response Rate (cross-sectional design) or Retention Rate (longitudinal design)
Pavan (2013)	Cross-sectional · Time since WLS: NI 2 groups: 1. Post-WLS seeking BCS 2. Control (matched BMI and demo-graphics)	N=35 1. n=35 2. n=33 Gender: 1. Female: 30; 2. Female: 23 1. Male: 5; 2. Male: 10 Race: NI Age: 1. 45.51±11; 2. 41.51±9.1 Post-WLS BMI: 1. 30.17±3.37	Bariatric restrictive procedures	BSQ	WLS group had higher BSQ scores than controls. A significantly higher number of WLS patients had moderate or high concerns with shape than the control group. Response rate: 50%
Pavan (2017)	Cross-sectional · Time since WLS: NI 2 groups: 1. Post-WLS seeking BCS 2. Control (matched BMI and demo-graphics)	N=36 1. n=36 2. n=21 Gender: 1. Female: 28; 2. Female: 14 1. Male: 8; 2. Male: 7 Race: NI Age: 1. 42.44±10.6; 2. 40.76±13.73 Post-WLS BMI: 1. 28.77±3.05	Sleeve: · 52.78% Band: · 22.22%	BUT: Italian version	BCS group reported more past plastic surgeries than controls (36.1% vs. 9.5%) BCS group reported significantly higher scores on Weight Phobia, Body Image Concerns, Avoidance, Depersonalization, Global Severity Index, and Positive Symptom Distress Index Global Severity Index was suggestive for "disease" (>1.2) for BCS group, but not for controls (<1.2). Response rate: NI
Menderes (2003)	Cross-sectional · Time since WLS: 27/2 months	N=11 Gender: Female: 7 Male: 4 Race: NI Age: 37.4 Post-WLS BMI: 34.4	Vertical banded gastroplasty Abdominoplasty=11 Reduction mammoplasty=3 Lateral thigh lift=2 Gynecomastia=3 Medial thigh lift=1 Liposuction=3	DAS	Of 38 post-WLS patients, 11 patients underwent 23 different plastic surgery interventions. The most frequently performed operation was abdominoplasty. Body image improved after BCS. Response rate: 90.9%
Pecori (2007)	Cross-sectional 4 groups: 1. Pre-WLS 2. >2 years post-WLS 3. >2 years post-WLS seeking BCS 4. >2 years Post-WLS and >1 year post-BCS	N=60 1. n=20 2. n=20 3. n=10 4. n=10 Gender: Female=60 Male=0 Race: NI Age: Overall NI Post-WLS BMI: Overall NI. Post-WLS BMI by groups ranged from 28.2±1.7 (post-BCS) to 31.2±4.5 (post-WLS)	Biliopancreatic diversion Leg or arm lift=8 Abdominoplasty=7 Mastoplasty=5 Torsoplasty=2	BUT	BUT scores were lower post-WLS. Post-WLS patients requesting cosmetic surgery had similar BUT scores to pre-WLS patients and had higher body uneasiness than post-WLS who did not seek cosmetic surgery. Those who had cosmetic surgery had lower body uneasiness scores than pre-WLS patients and post-WLS patients seeking cosmetic surgery. Response rate: NI

Study (ref) by Design and Year	Study Design Timeframe Group Description (if indicated)	Sample Characteristics Gender: n or % Race: n or % Age: Mean±SD years Post-WLS BMI: Mean±SD kg/m ²	WLS type ^a · n included if > 1 procedure BCS type	Body Image Measures · Subscales	Summary of Relevant Body Image Findings Response Rate (cross-sectional design) or Retention Rate (longitudinal design)
de Zwaan (2014)	Cross-sectional 3 groups: 1. Pre-WLS 2. Post-WLS, but no BCS 3. Post-WLS and BCS · Time since WLS: 37.8–49.8 months	N=393 1. n=79 2. n=252 3. n=62 Gender: Overall NI Race: Overall NI Age: Overall NI Age by groups ranged from 41.63±10.40 to 47.97±9.93 Post-WLS BMI: Overall NI Post-WLS BMI by groups ranged from 32.46±6.07 to 34.46±7.31	Bypass · n=175 Sleeve gastrectomy · n=71 Band · n=63 Other WLS · n=4 Abdominoplasty=55 Thigh lift=15 Breast lift=10 Lower back=7 Arms=6 Buttocks=4 Upper back=1	MBSRQ: German version · 10 subscales	Post-WLS groups reported better MBSRQ scores on 8/10 subscales than the pre-WLS group. BCS group reported better MBSRQ Appearance Evaluation (AE), Body Areas Satisfaction (BAS), and lower Self-Classified Weight (SCW) than post-WLS group without BCS, despite similar BMI; but no differences for 7/10 subscales. Compared post-abdominoplasty to non-BCS post-WLS group who were dissatisfied with abdomen. · After abdominoplasty, BCS group reported better MBSRQ AE, BAS, and SCW. Post-BCS, scores on MBSRQ-AE, Health Evaluation, Illness Orientation, BAS, Overweight Preoccupation, and SCW did not reach norms, but AO, Fitness Evaluation, Fitness Orientation, and Health Orientation did reach norms. Response rate: NI
Al-Hadithy (2014)	Cross-sectional 2 groups: 1. Post-WLS · Time since WLS: M=19.6 months 2. Post-BCS · Time since WLS: M=38.7 months	N=68 1. n=48 2. n=20 Gender: Female=44 Male=24 Race: NI Age: Age: 51 Post-WLS BMI: Overall NI Post-WLS BMI by groups ranged from 31.40 to 36.71	Restrictive WLS · n=38 Malabsorptive WLS · n=30 Abdominoplasty=24% Brachioplasty=19% Mastopexy=19% Interim abdominoplasty=9% Fleur-de-lys abdominoplasty=9% Lower body lift=5% Thigh lift=5% Mammoplasty=5% Neck reduction=5%	DAS	Best results were observed in patients who had undergone BCS following restrictive WLS. The authors reported statistically significant improvement in DAS scores, although did not report description of body image analyses or statistical values. Response rate: 90.7%
Song (2006)	Longitudinal Pre-BCS: · Baseline Post-BCS: · 3 months · 6 months · Time since WLS: M:20.5 months	N=18 Gender: Female=16 Male=2 Race: NI Age: 46±10 Post-WLS BMI: 29.4	WLS Type NI Abdominal contouring of panniculectomy or cosmetic abdominoplasty=18 Additional BCS=11	BISA CBIA PBIA PBSQOL	Body image improved following BCS. Body image satisfaction improved in only areas that underwent BCS, and this change resulted in increased overall body satisfaction. Self-perception based on current body image silhouettes changes post-BCS. Self-perception of appearance did not change. Retention: 3 months: 100%, 6 months: 72%
Stuetz (2008)	Longitudinal Pre-BCS: · Baseline Post-BCS: · 3 months	N=34 Control group: Post-WLS without BCS: n=26 Gender: Female: 30	Band Abdominoplasty	BFQ · Attractiveness Strauss and Appeltis' Questionnaire	Compared to the control group, the post-BCS group reported significant improvements in the body image attractiveness/self-esteem subscale. At 12 months post-BCS, 8 (23.5%) had a second BCS procedure.

Study (ref) by Design and Year	Study Design Timeframe Group Description (if indicated)	Sample Characteristics Gender: n or % Race: n or % Age: Mean±SD years Post-WLS BMI: Mean±SD kg/m ²	WLS type ^a · n included if > 1 procedure BCS type	Body Image Measures ·Subscales	Summary of Relevant Body Image Findings Response Rate (cross-sectional design) or Retention Rate (longitudinal design)
	· 12 months · Time since WLS: NI	Male: 4 Race: NI Age: 37.1±9.3 Post-WLS BCS BMI: 27.1±5.1 Post-WLS Control BMI: 27.9±3.7		for Assessing One's Body	Retention: 91.2%
Bracaglia (2011)	Longitudinal Pre-WLS: · Baseline Post-WLS: · 24 months Post-BCS: · 6 months	N=47 Gender: Female: 40 Male: 7 Race: NI Age: 41.55±9.48 BMI post-WLS: 31.28±9.35	Biliopancreatic diversion Abdominoplasty=11 Abdominoplasty & mastopexy=7 Arm lift=7 Abdominoplasty & arm lift=6 Mastopexy & arm lift=6 Mastopexy=5 Abdominoplasty, mastopexy, & thigh contouring=5	BAT	High BAT body dissatisfaction scores pre-WLS. Post-BCS, body image improved but did not reach norms. Post-BCS, only patients experiencing mastopexy, alone or with arm lift, scored within normal range for BAT scores. When three or more plastic surgery procedures were performed, all patients showed BAT scores within the normal range. Retention: NI
Koller (2013)	Longitudinal Pre-BCS: · Baseline Post-BCS: · 6 months	N=27 Gender: Females=25 Males= 2 Race: NI Age: 39.9±10.9 Post-WLS BMI: NI	Bypass · n=16 Band · n=11 Circumferential body lift	FBeK	Post-BCS, FBeK subscales attractiveness and self-confidence, as well as insecurity and uneasiness, improved significantly, while acculturation of one's body and sensibility remained unchanged. Retention: NI
Grieco (2016)	Longitudinal Pre-BCS: · Baseline Post-BCS: · 3 months	N=30 Gender: Females: 22 Male: 8 Race: NI Age: 50.5 Post-WLS BMI: 31.6	Bypass · n=13 Band · n=8 Sleeve gastrectomy · n=6 Other · n=3 Abdominoplasty	BIA-O Figure Ratings: Evolution of the Standard Stimulating Figure Tests	Post-BCS, patients reported slimmer body image perception based on the figure ratings. Retention: NI
Song (2016)	Longitudinal (2 cohorts) 1. Pre-WLS · Baseline Post-WLS · 6 months · 12 months · 24 months 2. Pre-BCS · Baseline Post-BCS · 6 months · 12 months	N=216 1. WLS n=175 2. BCS n=41 Gender: NI Race: NI Age: NI Post-WLS BMI: NI	Bypass Panniculectomy=32 Belt lipectomy=3 Lower body lift=2 Upper body lift=2 Breast reduction=2	MBSRQ	All MBSRQ subscales significantly improved after WLS except for Overweight Preoccupation; however, retention rates for the WLS group were extremely poor. After BCS, Appearance Evaluation, Appearance Orientation, Body Areas Satisfaction, and Self-Classified Weight improved significantly, but Overweight Preoccupation did not. Retention: 1. WLS: 6 months: 9.1% 12 months: 10.9% 24 months: 2.3% 2. BCS: 6 months: 75.6%

Study (ref) by Design and Year	Study Design Timeframe Group Description (if indicated)	Sample Characteristics Gender: n or % Race: n or % Age: Mean±SD years Post-WLS BMI: Mean±SD kg/m ²	WLS type ^a · n included if > 1 procedure BCS type	Body Image Measures · Subscales	Summary of Relevant Body Image Findings Response Rate (cross-sectional design) or Retention Rate (longitudinal design)
Vierhapper (2017)	Longitudinal Pre-BCS: · Baseline Post-BCS: · 32-83 months · Time since WLS:	N=40 Gender: Female=40 Male=0 Race: NI Age: 40.9±10.3 Post-WLS BMI: 27.6±3.6	Bypass · n=32 Band · n=4 Lifestyle change · n=4 Lower body lift	FBeK FKB-20	12 months: 65.9% FBeK: Scores for attractiveness and self-confidence improved post-BCS, but did not reach norms. The other three subscales, accentuation of own body, insecurity and uneasiness, and sexual discomfort did not change post-BCS. FKB-20: "Dismissive Body Rating" improved significantly after BCS, but remained worse than normative data of healthy female students. FKB-20: 'Vital Body Dynamics' decreased significantly after BCS, signifying that realization of power, fitness, and health was worse after BCS and worse than data from healthy female students. Pre-operative problems like eczema, shame, and difficulties with sport activities and clothes fitting were significantly improved after BCS. 62% wished for further BCS Retention: 72.5%
Danilla (2016)	Scale Development	Phase 1: n=16 pre- and post-BCS Phase 2: 1) 1029 general population 2) cohort before BCS and 3 months after BCS 3) cohort 1 and 3 years post-BCS Phase 3: n=34 Test-retest 2-4 weeks after BCS All surgery demographics split by: - before surgery: n=55 - after surgery: n=37 - before and after surgery: n=17	NI Unclear whether all post-BCS patients had a history of WLS	Phase 2 Body- OOL: 120 items · Satisfaction with body · Sex life · Self-esteem and social · Physical symptoms	In surgical group, all scores improved significantly from pre-BCS to 3 months post-BCS. Patients who did not desire BCS scored better than patients who desired BCS. Patients with a history of BCS scored better than control group regardless of desire to have BCS. In WLS patients, pre- and post- scores were lower than in BCS patients, but the improvement before and after surgery was equal between groups. Post-WLS patients scored lower on all domains than BCS patients. Response Rate or Retention: NI for all phases
Klassen (2016)	Scale Development	1. Both pre- and post-WLS asked to complete surveys at baseline, 1 week later, and 6 months later 2. Post-BCS patients 3. Exploring or seeking BCS and those who had BCS: Only those with history of WLS asked to complete Physical Scale and Symptoms checklist	NI	Body-Q · Appearance · Health-Related Quality of Life · Experience of healthcare	The pre-WLS group reported lower (poorer) body image scores than the post-BCS group. Participants with greater excess skin reported lower (poorer) body image scores than participants with minimal excess skin. Response Rate or Retention: Overall NI

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Study (ref) by Design and Year	Study Design Timeframe Group Description (if indicated)	Sample Characteristics Gender: n or % Race: n or % Age: Mean±SD years Post-WLS BMI: Mean±SD kg/m ²	WLS type ^a · n included if > 1 procedure BCS type	Body Image Measures · Subscales	Summary of Relevant Body Image Findings Response Rate (cross-sectional design) or Retention Rate (longitudinal design)
		4. Patients in weight loss program and collagen stimulation treatment Demographics by country			