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Bariatric Surgery, Body Image, and Mental Health: How is one's mental health affected in relation to changes in body image after extreme weight loss following bariatric surgery?

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ABSTRACT

In this thesis, a literature review was conducted to examine changes in body image following bariatric surgery and the relationship between body image and different aspects of psychological health. 26 Studies were selected for inclusion and reviewed. Changes in body image, depression, anxiety, disordered eating, and quality of life were evaluated and discussed. The results demonstrated consistent improvements in body image and all psychological variables, most commonly being depressive symptoms. This review confirms the link between weight loss, body image, and mental health and suggests body image counseling should be provided to those seeking bariatric surgery.

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INTRODUCTION

Bariatric surgery refers to surgical procedures performed on the stomach or intestines to aid in weight loss by shrinking the size of the stomach and limiting the amount of food one can consume before feeling full. The most common bariatric surgery procedures performed are Roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy (SG). Roux-en-Y gastric bypass is done by dividing the stomach and creating a small gastric pouch out of the upper part of the stomach which is connected to the mid-jejunum of the small intestine to form the Roux limb. Ingested nutrients will bypass most of the stomach, duodenum, and proximal jejunum and the new small stomach pouch restricts the amount of food someone can consume.¹ In sleeve gastrectomy, or vertical sleeve gastrectomy, about 80% to 90% of the total stomach is removed without interfering with the small intestine.¹ The remaining stomach is tube shaped and ingested contents pass quickly through the stomach into the small intestine. Other procedures classified as bariatric surgery include laparoscopic adjustable gastric banding (Lap Band or LAGB), Biliopancreatic diversion with duodenal switch (BPD-DS), and vertical banded gastroplasty (VBG). Average weight loss one year postoperatively ranges from 40 kg to 50 kg, or 29% to 35% percent weight loss, depending on surgery type.² Long-term weight loss maintenance varies, with many patients regaining weight.²

Bariatric surgery leads to improvements in both physical health associated with obesity including hypertension, type 2 diabetes, sleep apnea, asthma, and osteoarthritis.³ It also leads to improvements in depression and depressive symptoms⁴ and is associated with improvements in quality of life.⁵

Body image is defined as the perceptions, thoughts, and feeling associated with the body and the bodily experience.⁶ Body image is complex and multidimensional and can be influenced

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by many different variables including gender, culture, age, personality, experiences, state of the body and mind, and more. Cultural messages portrayed through the media define and emphasize societal norms about what bodies are considered physically attractive or unattractive and often promote body-altering means to achieve this socially acceptable figure. These cultural norms and messages can influence the attitudes people have about their own bodies and individuals with bodies or physical characteristics that stray outside of these expectations may develop a negative body image. Other major factors that contribute to poor body image include low self-esteem and lack of social support.⁶

There is a strong societal stigma against individuals who are overweight and these people experience frequent bias and discrimination based on their weight in employment, health care, educational, and interpersonal settings.⁶ Through it is not universal, overweight individuals generally have increased body dissatisfaction and distress as a result of stigmatization. A 2014 review, concluded that completion of a weight loss intervention was associated with improvements in self-esteem, depression, health related quality of life, and body image.⁷ Although in this review, body image was found to be most closely correlated to amount of weight lost,⁷ other research suggests the amount of weight lost is not strongly correlated to degree of body image improvement.⁶

Bariatric patients experience improvements in body image following surgery, as a result of significant weight loss.⁸ This relationship between body image changes and mental health changes following bariatric surgery has been studied, however, there has been no systematic review to examine the evidence for a connection between the two. This thesis aims to examine how massive weight loss, following bariatric surgery, can affect one's body image and, consequently, mental health. The research question was: How are mental and emotional health

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affected by changes in body image following bariatric surgery? A literature review was conducted to describe the research on this topic and synthesize findings to identify whether changes in body image affect changes in mental health following bariatric surgery.

METHODS

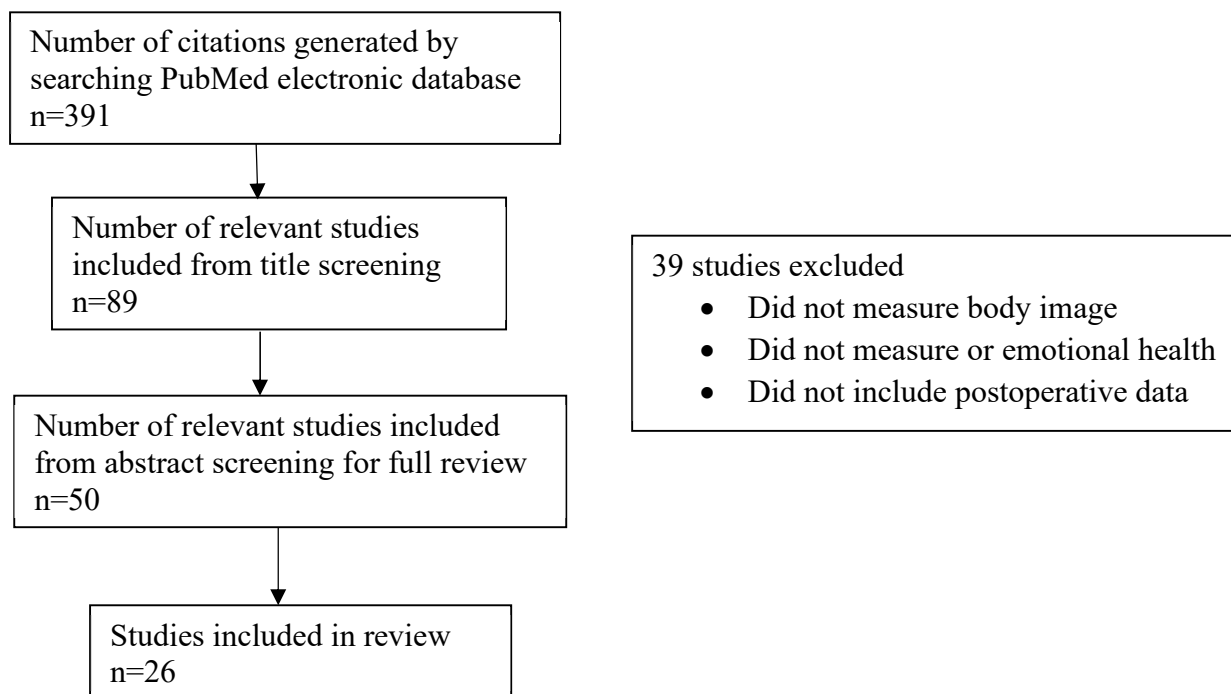
A literature review was conducted to examine how changes in body image bariatric surgery impacts different aspects of mental health including depression, anxiety, eating disorders, and overall emotional health. Articles were retrieved using the National Library of Medicine's PubMed database using the following two search terms: "bariatric surgery" and "body image." Studies from this search that were included in this review measured both body image and at least one aspect of mental health in bariatric surgery patients postoperatively. In this review, mental health refers to psychological and emotional symptoms of various mental illnesses, specifically that of depression, anxiety, and eating disorders.

The search resulted in 391 total studies. Titles were screened and 88 studies were included for data extraction. The titles must specifically mention body image or body satisfaction/dissatisfaction *and* mental health, psychological effects, etc. Additionally, the studies needed to be focused on adults, include results reported after surgery, and include post bariatric surgery weight loss patients, not just people who had undergone extreme weight loss. From the title screening 88 studies were included for further review. A new spreadsheet was created for these and their abstracts were screened for relevance to the question. Studies that did not measure body image, did not measure mental or emotional health, or did not include postoperative data were excluded from further evaluation. From the abstract screening, 38 articles were excluded and 50 articles were included for full review and data extraction.

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A data extraction was done using a spreadsheet was created to organize the studies and identify relevant information for description and comparison. Relevant study design and participant information was recorded for each study using the following headings: study type, participants, surgery type, pre-surgery BMI and weight, post-surgery BMI or weight loss, sample size, methods, purpose, strengths, and weaknesses. The following information was also recorded related to body image, mental health and emotional health: measurements for body image, depression, anxiety, and eating disorders and how these were measured. Prevalence or scores, relationship to body image, and interpretation of these results were included as headers for depression, anxiety, and eating disorders. Notes on sexual intimacy/functioning, quality of life, and social relations were also recorded if applicable. From this step, 24 articles were excluded and 26 were included in this literature review. See Figure 1 for systematic review flow chart.

Figure 1. Methods of Systematic Review Flow Chart



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RESULTS

Study Characteristics

Of the 26 included, 12 studies had a longitudinal study design in which participants were surveyed before bariatric surgery and at one or more points in time following surgery and 12 studies were cross-sectional in which participants were surveyed once at some point in time after surgery. The remaining studies included one case study and one systematic review. Postoperative data was gathered from a range of different time points ranging from three months to over nine years. There were 17 studies that collected data beyond one year postoperatively, while 9 studies assessed patients at time periods of one year or less. Of the studies with set time points for postoperative assessment, a majority of the time points ranged from 6 months to 24 months, but one study collected data nine years postoperatively.

Sample size ranged from 5 participants in a case study⁹ to 61,708 participants in a large cross-sectional study,¹⁰ the median sample size being 99 participants. There was a female majority in every study and patients were primarily Caucasian. Though a large portion of bariatric surgery data is from Caucasian females, these participant characteristics are representative of the population of those who undergo bariatric surgery.

Weight Loss

Weight data, for the most part, was assessed using body mass index (BMI) and preoperative and postoperative BMI of the bariatric surgery group is recorded in Table 1. Average preoperative BMI for all of the included studies was 46.8 kg/m², falling in the BMI category of class III obesity (BMI equal or greater than 40.0). Average postoperative BMI was 35.1 kg/m² which is at the lower end of range for class II obesity (BMI 35.0 to 39.9). Time of

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Table 1. Study Characteristic and Measurements

Author	Year	Study Type	N	% Female	Measurement Points	Average Preoperative BMI (kg/m ²)	Average Postoperative BMI (kg/m ²)	Body Image Measure	Depression Measure	Anxiety Measure	Eating Disorder Measure
Behrens	2020	Longitudinal	52	55.8	Pre 21-80 mo. post	47.8	36.8	BIQ-20	PHQ-9	N/A	N/A
Conceição	2020	Longitudinal	64	85.1	Pre, avg 2 yr. post	46	33.5	BSQ	BDI-II	N/A	EDE-Q
De Zwaan	2014	Cross-sectional	314	N/A	12-185 mo. post		34.5	MBSRQ	PHQ-9	GAD-7	N/A
deMeireles	2020	Longitudinal	6500	80.7	Pre, 1 yr. post	47.2		Body-Q	N/A	N/A	N/A
Geller	2020	Longitudinal	81	56.0	Pre, 3-23 mo. post	43.1	30.1	BSQ-8C	PHQ-9, SBQ-R	GAD-7	EES
Hayden	2011	Longitudinal	258	84.9	Pre, 12 mo. post	44.2	34.3	BDI-II	BDI-II	N/A	N/A
Ivezaj	2019	Cross-sectional	145	82.8	6 mo. post	46.8	37.7	EDE	BDI-II	N/A	EDE
Klassen	2012	Cross-sectional	43	93.0	Up to 7 yr. post			Interview	N/A	N/A	N/A
Kochkodan	2018	Longitudinal	61708	78.1	Pre, 1 yr. post			Body-Q	PHQ-8	N/A	N/A
Kubik	2013	Systematic Review	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Legenbauer	2020	Cross-sectional	291	70.4	9 yr. post	50.4	39.3	BIAQ, BIA-O	HADS, CIDI	HADS, CIDI	TFEQ, SIAB-EX
Mirijello	2015	Cross-sectional	46	69.5	2-218 mo. post		34.6	BSQ	Zung-SDS	LSAS, STAI	N/A
Monpellier	2018	Cross-sectional	590	N/A	2-3 yr. post	45.4	30.7	BSQ, MBSRQ-AS	BDI-II	N/A	N/A
Nickel	2017	Longitudinal	30	56.7	Pre, 6 & 24 mo. post	50.2	33.0	BIQ	SF-36	N/A	N/A
Ortega	2012	Longitudinal	60	74.2	Pre, 6 & 12 mo. post	44.9	29.9	BSQ	SCL-90-R	SCL-90-R	N/A
Pavan	2017	Cross-sectional	36	77.8	6+ mo. post		28.8	BUT, MINI	BDI-II, MINI	MINI	BES
Pona	2016	Cross-sectional	229	68.3	3 mo. post	51.1		Self-report	MMPI-2-RF	N/A	N/A
Preiss	2018	Longitudinal	99	80.0	Pre, 1, 2, 3, 4, 5 & 6 mo. post	42.6		EDE-Q	BDI-II	N/A	N/A
Ramalho	2015	Cross-sectional	61	100.0	avg 19 mo. post	44.8	30.45	BSQ, ESIQ	BDI-II	N/A	N/A
Sarwer	2010	Longitudinal	200	73.0	Pre, 20, 40 & 92 wk. post	51.4		BIQLI, BSQ	SF-36	N/A	N/A
Singh	2012	Cross-sectional	104	78.0	7-10 yr. post		32.2		SF-36	N/A	N/A
Teufel	2012	Longitudinal	51	64.7	Pre, 1 yr. post	51.3	35.9	BIQ-20	PHQ-9	N/A	N/A
Van Hout	2008	Longitudinal	104	87.5	Pre, 6, 12 & 24 mo. post	45.4	31.9	BAT	SCL-90	SCL-90	N/A
Vangoitsenhoven	2016	Cross-sectional	23	73.9	7 yr. post	43.0	32.4	Self-report on scale of 0-100	HADS	HADS	DEBQ
Wallace	2019	Cross-sectional	184	84.1	2-8 yr. post (avg 42.15 mo.)			Researcher-made survey	PHQ-9	N/A	N/A
Watson	2020	Case study	5	100.0	9+ mo. post	48.3	31.2	Interview	N/A	N/A	Interview

post bariatric surgery data varied from study to study and ranged from three months to over nine years, but on average the patients BMI in the included studies was reduced by 11.7 kg/m².

Body Image

Body image was measured in a wide array of different assessments, but questionnaires were used in most studies. The most common surveys used were the Body Shape Questionnaire (BSQ) and the Body-image Ideals Questionnaire (BIQ) and other body image questionnaires were used in only one or two papers. Four studies did not have an explicit measure of body image and information on participants' body image was gathered from an interview or self-report status of body image.

There was an overall improvement of body image following bariatric surgery among the studies. Of these, 12 out of 26 studies examined body image both before and at one or more point in time after surgery and all found significant improvements in body image scores in postoperative data. Some indicators of improved body image include reduced body image dissatisfaction, avoidance, and negative evaluation of the body. Three of the studies that examined postoperative body image at multiple different time points reported significant improvements in body image at 40 weeks or less postoperative, but leveling off with no significant improvements beyond this.¹¹⁻¹³ Studies that compared body image of post bariatric surgery patients to other groups found they had lower body image dissatisfaction than obese controls and those awaiting bariatric surgery,¹⁴⁻¹⁶ but higher body image dissatisfaction when compared to non-obese controls¹⁷ or those who underwent body contouring surgery.^{14,18}

Three studies, all interview formatted and only collecting postoperative body image data, all found concerns with body image consistent throughout the patients. The 2019 study by Ivezaj

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reported overvaluation of weight or shape in 51.7% of bariatric surgery patients following surgery.¹⁹ Overvaluation of weight or shape refers to when an individual exclusively or predominantly bases their self-worth or self-perception on how much they weight or the shape of their body. The other two interview-based studies' postoperative body image findings were heavily focused on excess and hanging skin.^{9,20} In a study interviewing patients seeking BCS following bariatric surgery, many preferred their body before surgery and felt worse about their appearance than when they were overweight. Many reported that the loose skin made them look older than before weight loss, that they attempt to hide their skin as much as possible, and that "at least the skin was smoothed out by the fate before weight loss."²⁰ In another study, patients reported fear of regaining lost weight and a hatred and disgust for their excess skin as it "still looks like fat" and reminded them of their pre-surgery weight.⁹

A cross-sectional study examined the relationship between excess skin and body image and found that greater overall physical impairment due to excess skin is associated with greater concerns regarding weight and body shape.²¹ Those who had undergone body contouring surgery (BCS) had greater improvements in body image and higher body satisfaction than post bariatric surgery patients who had not.^{14,18} Further, post bariatric surgery patients who desired/were seeking BCS had lower body image than post bariatric surgery patients that were not interesting in BCS.^{18,22} Excess skin seems to be what lowers body image as evidenced by the interviews and the fact that those with BCS have better body image.

Depressive Symptoms

Twenty-three studies looked at the relationship between bariatric surgery and depression or depressive symptoms.^{8,10-19,21-32} Ten different assessments were used across the studies, majority of which were questionnaires. The most common assessments of depression were the

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Beck Depression Inventory-II (BDI-II), with seven studies utilizing this questionnaire, and the Patient Health Questionnaire (PHQ-8 or PHQ-9), used by six studies. Other methods of measuring depression directly included the Hospital Anxiety and Depression Scale (HADS), Suicidal Behaviors Questionnaire (SBQ-R), and Zung Self-rating Depression Scale (Zung-SDS). Other studies used more general assessments of mental health that are used to assess a multitude of psychiatric disorders and aspects of mental health. These questionnaires included the Short-form Health Survey (SF-36), Symptoms Checklist-90 (SCL-90), Minnesota Multiphasic Personality Inventory (MMPI-2-RF), Mini International Neuropsychiatric Interview (MINI), and Composite International Diagnostic Interview (CIDI).

In general, the studies found reduced depression and depressive symptoms were associated with improvements in body image following bariatric surgery. Of the 23 studies that assessed depression, 19 of them found this relationship. Of the three studies that compared depression symptoms of post bariatric surgery patients and obese controls, two of them found reduced depressive symptoms in the postoperative group compared to the obese controls^{14,16} and one did not find a significant difference between the groups.¹⁵ A 2013 systematic review, it was presented that mental health improvements, including reduced depressive symptoms have also been reported by patients who fail to lose weight and by patients shortly following surgery, before any significant weight loss.⁸

A few studies found gender differences in depression outcomes. Kochkodan found that though both men and women have overall improvements in all psychological measures, including body image and depression, following surgery, women had significantly lower body image scores, psychological well-being, and higher rates of physician diagnosed depression than

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men postoperatively.¹⁰ Kubik reported BID to be heavily associated with depression, especially in women, likely as a result of the emphasis society places on the female physique.⁸

Four studies did not find a significant relationship between depression and body image, regardless of improved body image following bariatric surgery or difference in body image between groups.^{15,22,24,31} One of these studies did note that the prevalence of lifetime major depression was significantly higher in post bariatric patients compared to the controls, but current depression score between the two groups were not significant.²²

Anxiety

Nine studies examined anxiety or anxiety symptoms and the relationship with bariatric surgery.^{8,13-16,22,25,27,28,32} Most studies used different methods to assess anxiety, some studies used questionnaires that assess anxiety directly, while others used questionnaires that were general assessments of mental health. Questionnaires that directly assessed anxiety include the Generalized Anxiety Disorder-Item Scale (GAD-7), Hospital Anxiety and Depression Survey (HADS), Liebowitz Social Anxiety Scale (LSAS), and State and Trait Anxiety Inventory (STAI). General mental health assessments include the Symptoms Checklist-90 (SCL-90), Mini International Neuropsychiatric Interview (MINI), and Composite International Diagnostic Interview (CIDI).

Seven of the nine studies that measured anxiety found significant improvements in anxiety symptoms in post bariatric surgery data (citations). Of these, three studies were longitudinal, measuring body image and mental health before surgery and at one or more points in time following surgery. These three studies found improvements in post-surgery anxiety symptoms were significantly associated with reduced body image dissatisfaction and overall

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improved body image.^{13,25,28} Three cross-sectional studies also found a relationship between body image and anxiety when comparing post-surgery bariatric patients to other groups.^{14,22,27} Higher body image was correlated with reduced anxiety across all groups. Post bariatric surgery patients had higher body image and lower levels of anxiety than the obese controls,^{14,27} but lower body image and higher levels of anxiety than non-obese controls²² and post bariatric surgery patients that had undergone body contouring surgery.¹⁴ One study observed both higher generalized anxiety and lifetime panic disorder in post bariatric patients compared to the controls, which was associated with body image concerns and avoidance, as well as body dysmorphic disorder.²² The remaining two studies (both cross-sectional) comparing post bariatric surgery patients to an obese control group found no significant difference in anxiety between the two groups.^{15,16}

Disordered Eating

Eight studies investigated the relationship between bariatric surgery and eating behaviors or disordered eating.^{8,9,16,19,22,24,25,27} Of these two studies used the Eating Disorder Examination (EDE) which assesses the range and severity of various different eating disorders. One study used the Binge Eating Scale (BES) while another used the Structured Interviews for Anorexic and Bulimic Disorders (SIAB-EX) which are specific to binge eating or anorexia and bulimia, respectively. One study assessed eating behavior through a semi-structured interview. The remaining questionnaires assessed disordered eating with measures focused on various eating behaviors including Three-Factor Eating Questionnaire (TFEQ), Emotional Eating Scale (EES), Dutch Eating Behavior Questionnaire (DEBQ).

As there were a variety of disordered eating assessments, there were consequently a variety of findings regarding eating behaviors and their relationship to body image following

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bariatric surgery. Two longitudinal studies surveyed patients before and after bariatric surgery, one finding significant improvements in eating disorder psychopathy which correlated to body image²⁴ and the other finding significant improvements in emotional eating, but was not significantly associated with body image²⁵ Three studies compared body image and disordered eating of post bariatric surgery patients to other groups and found that post-surgery patients had higher prevalence of binge eating disorder than non-obese controls²² and more inclined to eat based on external cues than obese controls¹⁶ A case study by Watson⁹ described five female post bariatric surgery patients who met the DSM-V criterion for anorexia nervosa and reported fears of regaining weight that was lost as a result of surgery. The women in this study reported disordered eating behaviors including calorie counting, restriction, self-induced vomiting and the use of laxative-like medicine. The remaining study was a cross-sectional study that found in post bariatric patients, an overvaluation of weight or shape was significantly associated with a greater frequency of loss of control (LOC) eating and higher scores on the EDE. This study also reported that those with higher EDE scores and greater frequency of LOC eating were significantly more likely to have a history of binge eating disorder (BED).¹⁹

Quality of Life/Psychological Well-Being

Sox studies measured quality of life and examined the relationship between bariatric surgery and quality of life.^{12,14,16,20,22,31,33} Quality of life was measured using the Short-form Health Survey (SF-36), Impact of Weight on Quality of Life Questionnaire (IWQOL), Quality of Life Enjoyment and Satisfaction Questionnaire – Short Form (Q-LES-Q SF), and interviews.

There were overall improvements in quality of life and psychological well-being following bariatric surgery in 6 all the studies. Quality of life scores improved preoperative to postoperative and were higher in postoperative patients when compared to obese controls. One

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study relied on postoperative interviews, without directly measuring quality of life or psychological well-being, however, patients reported some psychological, social, and sexual concerns in regards to their body image and excess skin.

Results Tables: Table 2 and Table 3 display the findings from each of the primary studies. The tables are separated by study type. Table 2 includes studies with a longitudinal design that observed patients before and at one or more point in time after surgery. These studies directly measured changes in psychological variables over time. Table 3 included studies with cross-sectional study designs, some with comparison groups and some without, that survey participants following surgery. These studies compared the body image and psychological variables between groups or looked at relationships between the variables in post-surgery patients.

Organizing studies by design allowed for identification of trends in changes and mental health following surgery and to see how bariatric patients generally compared to non-bariatric patients. All longitudinal studies looking at body image found improvements as the result of surgery. Quite a few of the studies looking at body image at 6 months and later found that the improvements were seen at 6 months, but then after did not change. Also, all the studies measuring anxiety also measured depression and anxiety improved in all studies post operation. There was more variability in the cross-sectional studies. These studies were more likely to have qualifying statements like “higher depression scores were associated with worse body image scores.” Post-bariatric patients generally had better scores on depression and anxiety compared to all groups, except those that underwent body contouring surgery.

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Table 2. Results of Longitudinal Studies

Author	Year	Body Image Change	Depression Change	Anxiety Change	Disordered Eating Change	Outcome
Behrens	2020	Body image improved	Depression improved	N/A	N/A	Improvements in depression were moderately associated with improvements in body image. Higher excess weight loss and NEB associated with reduced depressive symptoms.
Conceição	2020	Body image improved	Improvements in depression not significant	N/A	Disordered eating improved	No relationship found between body image and depression. Improvements in eating disorder psychopathy were for postoperatively.
deMeyreles	2020	Body image improved	Depression improved	N/A	N/A	Psychological well-being scores improved postoperatively and were associated with the improvements in body image scores.
Geller	2020	Body image improved	Depression improved	Anxiety improved	Disordered eating improved	Improvements in BID post bariatric surgery correlated to decreased depression, anxiety, and risk of suicide. Improvements in emotional eating behaviors 1 year after surgery.
Hayden	2011	Body image improved	Depression improved	N/A	N/A	Improvements in depression associated with improvements in negative self-attitude and body image.
Kochkodan	2018	Body image improved	Depression improved	N/A	N/A	Improvements in body image were associated with improvements in psychological measures including depression. Women had significantly higher rates of depression both pre and postoperatively.
Nickel	2017	Body image improved	Depression improved	N/A	N/A	Correlation between body image scores and mental health scores before surgery, 6 months postoperative, and 24 months postoperative. Mental health was improved at 6 months and at 24 months after surgery, but no significant improvements between 6 and 24 months.
Ortega	2012	Body image improved	Depression improved	Anxiety improved	N/A	Improvements in both depression and anxiety were associated with improvements in body image 1 year postoperatively.
Preiss	2018	Body image improved	Depression improved	N/A	N/A	Greater improvements in depression scores were associated with greater improvements in body image dissatisfaction and self-esteem.
Sarwer	2010	Body image improved	Depression improved	N/A	N/A	Improvements in body were significantly correlated to improvements in mental health and quality of life. Larger weight loss was associated with greater improvements in body physical and emotional aspect of quality of life.
Teufel	2012	Body image improved	Depression improved	N/A	N/A	Improvements in body image and reduced depression symptoms 1 year postoperatively
Van Hout	2008	Body image improved	Depression improved	Anxiety improved	N/A	Body image, depression, and anxiety improved 6 months after surgery, but showed no significant changes after.

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Table 3. Results of Cross-sectional Studies

Author	Year	Comparison Group(s)	Outcome
De Zwaan	2014	Pre-bariatric surgery patients Post-BCS patients	Post-bariatric surgery patients exhibited lower BMI, were older, reported less symptoms of depression and anxiety, a better quality of life in all domains, and improved body image.
Ivezaj	2019	N/A	Over half of post-bariatric surgery patients endorse overvaluation of weight or shape. Overvaluation of weight or shape was associated with increased LOC eating and depression scores
Klassen	2012	N/A	Massive weight loss left many patients unhappy with the appearance of excess, loose skin, which created a range of physical, sexual, psychological, and social health concerns for patients. Loose, baggy skin affected their self-esteem and mood, making them feel depressed and extremely self-conscious about their appearance.
Legenbauer	2020	Conventional weight loss group Obese control group	Body dissatisfaction was lower in SURG compared to conventional weight loss group and comparable to that of obese controls at 9 years postoperative. Higher levels of body dissatisfaction and body avoidance behavior associated with higher levels of depression, anxiety, and disinhibited eating.
Mirijello	2015	Pre-bariatric surgery patients	Patients that had already undergone bariatric surgery had lower distress over body shape and body image. No differences found in state anxiety, trait anxiety, and current depression between those that had bariatric surgery and those who had not.
Monpellier	2018	Post-bariatric surgery patients that desired or did not desire BCS Post-BCS patients	Bariatric surgery patients who desired BCS surgery had increased body image and body shape concerns than those who did not desire BCS or already undergone BCS. Negative body image was associated with more depressive symptoms. Those who desired BCS had higher depressive symptoms than those who did not.
Pavan	2017	Non-obese control group	Bariatric patients had higher prevalence of body dysmorphic disorder and high scores in body image concerns and avoidance. Current depression scores were not different among bariatric surgery patients and the control group, but bariatric patients had higher scores for lifetime major depression. Bariatric patients had higher prevalence of generalized anxiety, lifetime panic disorder, and binge eating disorder.
Pona	2016	N/A	Patients that had indicated body image concerns, had higher levels of preoperative depression and postoperative depressive symptoms.
Ramalho	2015	N/A	Increased depressive symptoms were associated with excessive skin on the abdomen and greater concerns with body image
Singh	2012	Non-obese control group Obese control group Post-bariatric surgery, post-BCS patients	Bariatric surgery and consequently weight loss and body changes did not correlate to any changes in mental health scores.
Vangoitsenhoven	2016	Obese control group	Post-surgery group had a significantly greater satisfaction with current body weight and body image than obesity controls. Improvements in depression were correlated to improvements in body image. Anxiety was not affected. Post-surgery group more prone to eat from external cues.
Wallace	2019	N/A	40% would not choose to repeat bariatric surgery again if given the chance. Dissonant patients had higher total postoperative weight regain, failed weight loss expectations, depression, and dissatisfied body image. Depression levels were associated with body dissatisfaction and failed weight loss post bariatric surgery.
Watson	2020	N/A	Disordered eating developed after bariatric surgery in fear of regaining lost weight. The women knew the restrictive behaviors would not improve the excess skin, its presence was enough to incite fear around weight gain and perpetuate the disordered eating.

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DISCUSSION

The psychological effects of obesity and weight loss are well researched and understood,⁷ but there is limited information on how weight loss specifically by means of bariatric surgery influences different psychological aspects. This literature review focused on studies which examined samples of patients that underwent bariatric surgery in order to lose weight. A review of 26 studies revealed positive psychological changes post-operatively in the majority of studies reviewed. Specifically, postoperative improvements in body image, depression, anxiety, disordered eating, and quality of life were consistently observed throughout the literature.

Higher levels of body image and body satisfaction following bariatric surgery, are likely a consequence of a lower weight. Previous research has found that body dissatisfaction is generally higher in individuals with obesity compared to those with normal weight.³⁴ Further, studies that look at body image before and after weight loss find that body image improves as a person loses weight, even just small amounts, and worsens if weight is regained.⁶ Body image varies from person to person and it is possible for slimmer individuals to have poor body image, but generally body image is worse in those with higher body weights and improves as a person loses weight. This is consistent with expectations as there is societal stigma and discrimination against those that are overweight which results in these individuals feeling negatively about their bodies.

Significant improvements in body image occur following participation in behavioral and/or dietary weight loss interventions.⁷ These improvements are associated with decreases in weight, but body image improvements have been detected even in absence of weight loss. These psychological improvements are thought to be attributed to emphasis on self-acceptance and separating eating behaviors from emotions that are a foundation of various behavioral weight

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loss interventions.⁷ Patients who undergo bariatric surgery must make substantial changes to dietary intake and frequently describe better management of emotional eating and more intentional choices.³⁵ There may be secondary body image and other psychological improvements as a result of behavior changes including exercise, eating behaviors, and in our case, undergoing weight loss surgery. Taking action in reducing one's weight may improve self-esteem and consequently body image, but it is near impossible to differentiate between the psychological benefits of weight loss compared to weight loss intervention.

The link between obesity and depression is well researched, with a large number of studies and reviews demonstrating both that depression can be worsened by obesity and that obesity can be a symptom of depression.³⁶ This literature review confirmed that depression and symptoms of depression were alleviated postoperatively, corresponding to both weight loss and improvements in body image. As previously discussed, weight and body image are so deeply intertwined that it makes it difficult to distinguish whether it is weight loss or improved body image that is responsible for the correspondence to mental health. It is likely a combination of both that creates the strong relationship to depression and mental health. There is evidence that depression might be related to inflammation, which is high in obesity, so weight loss could be impacting brain function.³⁶

Poor body image may be a consequence of depression. Those with increased depressive symptoms may be more likely to think poorly of themselves and their body compared to those without depression. Studies in this review examined individuals who sought out surgical means to reduce their weight and because of this, the sample presented in this review likely have elevated body image concerns compared to the general obese population. There are people with obesity that have excellent mental health and have a positive view of their body just as there are

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people whose weight is in the normal or underweight range that have mental health issues and a negative view of their body. Individuals who seek bariatric surgery likely have multiple reasons that likely include body image concerns.

The majority of body image dissatisfaction following extreme weight loss from bariatric surgery is associated with the presence of excess, hanging skin of the abdomen, breasts, thighs, and arms. Post-bariatric patients report excess skin causes a variety of physical and psychological concerns including pain and discomfort and body dissatisfaction. Body contouring surgery (BCS) is performed to remove and reconstruct excess skin and improve the appearance of skin and tissue following major weight loss. A finding from this review is that patients who underwent BCS demonstrated fewer concerns regarding body image and reduced depression. Moreover, patients who desired BCS had significantly more negative body image compared to the patients that did not desire BCS.¹⁸ This finding suggests that weight loss may not be the only factor influencing body image. Moreover, extreme weight loss may lead to a different type of body dissatisfaction, due to excess skin. Patients, especially those exhibiting poor body image, should be counseled that surgery may or may not improve their body images as well as be prepared for excess skin.

This review systematically examined the literature and organized findings by both study topic and by study type which aided in identifying patterns and summarizing findings. PubMed was used as the primary database, however, including other databases such as Psych Info (psychology research) and CINAHL (nursing and allied health) may have yielded more studies for inclusion. Furthermore, the topic of the review was narrow, and did not examine the relationship of weight loss to either body image or mental health disorders. Though all the studies included found overall weight reductions postoperatively, this review did not focus on

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how the magnitude of weight loss might affect body image or mental health. It could be predicted that greater weight loss would result in greater body image and psychological improvements, as both have been found to correlate with weight, but we must also consider the harmful effects excess skin resulting from extreme weight loss may have on an individual. In addition, it is possible there is a point at which further weight loss no longer impacts body image as suggested by studies finding no changes in body image after six months. More research is needed to identify whether too much weight loss following bariatric surgery can potentially have negative effects on one's body image and mental health.

The variety of methods and tools used to measure body image and the other psychological health variables made comparisons across studies difficult. Different methods require different interpretations and applications for results. There is a difference in wanting to lose weight and being unhappy with one's body. For example, after bariatric surgery an individual may have improved body image, but when asked, still report they would like to weigh less. Additionally, there was limited research on changes in anxiety and eating behaviors following bariatric surgery and how these mental illnesses correspond to body image.

Though body image and psychological health appear to be heavily intertwined and correlated, there is limited research examining the relationship between the two. Body image is closely correlated with body weight; therefore, it is difficult to determine how each affects mental health. Controlling for weight in future research may help provide more insight on the relationship between body image and depression, anxiety, eating disorders, and other mental health variables. In addition, causality is also in question. Body image, obesity, and mental health are all related but whether each is the cause or result remains unclear. It may be beneficial for future studies to differentiate between body image evaluation and body image investment.⁶

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This would help uncover whether body dissatisfaction or the importance placed on physical appearance is more strongly related to mental illness.

With the findings gathered from this review, it is evident that though improvements in body image and psychological health were observed, there are still body image concerns that follow extreme weight loss from bariatric surgery. Patients that undergo bariatric surgery may hold unrealistic expectations about the aesthetic results of bariatric surgery, which can produce body dissatisfaction and other psychological concerns if these expectations are not met.⁶ It is important to inform those going into to weight loss surgery what their body will potentially look like and discuss the possibility of body contouring surgery. It could also be advisable for individuals seeking bariatric surgery to undergo some kind of behavioral cognitive therapy both before and after surgery in order to reduce negative thoughts they may have about their body and the importance their body evaluation has on their psychological health.

CONCLUSION

A literature review of 26 studies demonstrated consistent significant improvements in body image and mental health following bariatric surgery. Specifically, improvements in depressive symptoms were observed and significantly correlated with improvements in body image. Though body image improvements following bariatric surgery were seen in all of the reviewed studies, body image concerns still remained regarding the appearance of excess skin.

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