

Body image of patients with morbid obesity before and after bariatric surgery



Universiteit Utrecht

M. Verhagen

Student number: 3632482

Clinical and Health Psychology (Master thesis)

June 2016

Supervision: prof. dr. R. Geenen

Table of contents

	Page
Abstract	3
Prologue	4
Introduction	5-12
Level of body image before and after bariatric surgery	7,8
Factors associated with body image	9,10
Body image and weight loss	10-12
Methods	13-16
Patients and control group	13,14
Procedure	14
Measures	14,15
Statistical Analysis	15,16
Results	17-24
Descriptives	17
Body image of patients before and after bariatric surgery in comparison with the general population	18-20
Determinants of body image before and after bariatric surgery	20,21
Appearance evaluation and appearance orientation as predictors of weight loss	21-24
Discussion	25-29
Limitations and future research	27,28
Implications	28,29
References	30-32
Appendix	33-36
A- Table 4	33
B- Table 5	34
C- Table 6	35
D- Table 7	36

Abstract

Morbid obesity can have severe psychological impact and is a major risk factor for health issues (Schwartz & Brownell, 2004), such as type 2 diabetes, hypertension and sleep apnea (Gilmartin, Long & Soldin, 2013), higher levels of stress, anxiety, depression, food craving and binge eating disorder (BED) symptoms (Abilés, Rodríguez-Ruiz, Abilés, Mellado, García, Pérez de la Cruz, Fernández-Santaella, 2010) and impairments in quality of life (Sarwer, Lavery & Spitzer, 2012). Understanding body image in relation to obesity may contribute to comprehension of the etiology and maintenance of obesity and may help in improving care. The current study examines the level of body image of patients with morbid obesity before and after bariatric surgery in comparison with the general population, the factors associated with body image before and after bariatric surgery, and the relation of body image with weight-loss outcome. Body image of 379 patients with morbid obesity was compared to a matched control group of 1517 people from the general population. Body image was measured with a shortened Dutch version of the Multidimensional Body-Self Relations Questionnaire (MBSRQ; Cash, 2000) and Self-Esteem was measured with the Dutch version of the Rosenberg Self-esteem Scale (Rosenberg, 1965; Woertman, 1994). Patients who underwent surgery scored better in terms of appearance evaluation than patients before surgery, but there was still a large difference with the general population. Preoperative patients judged their appearance worse than postoperative patients but attached less importance to their appearance than postoperative patients. Appearance evaluation was shown to be independently predicted by self-esteem indicating lower levels of appearance evaluation in patients with low self-esteem. Moreover, appearance orientation before surgery was shown to be independently predicted by gender, indicating lower levels of appearance orientation in male patients. After surgery, gender and middle education were significant predictors of appearance orientation. Neither body image nor other variables could predict weight-loss. For clinical practice, this study underlines the existence of a subgroup of patients experiencing problems with their body image. Female patients and patients with low self-esteem need extra attention when it comes to body image. Future research, mostly longitudinal, is needed.

Keywords

Body image, appearance evaluation, appearance orientation, morbid obesity, bariatric surgery, MBSRQ, self-esteem

Prologue

I can hardly believe my study psychology has come to an end. Beautiful, educational years of hard work is now crowned with this master thesis. I am thankful I was able to write my thesis about the body image of patients with morbid obesity. I have always been interested in the concept of body image, what influences body image and how and why this differs between people.

This interest, among other things, has to do with personal experiences and conversations with close friends. Nowadays the subject 'healthy food' is trending with a lot of different views circulating on social media about how to eat healthy and how you are supposed to feel after following a certain diet. Within my group of female friends I have noticed we all respond different to those messages. With conversations about our own body image we all try to grasp *why* we do or don't feel good about ourselves at that time.

With writing this thesis I had the chance to learn a lot about factors associated with body image and hopefully I have succeeded to contribute to the existent scientific knowledge about the concept of body image.

I hope you will enjoy reading this thesis as much as I enjoyed writing it. I would like to thank Valerie Montpellier, Marita Schouten and Martina Visscher for their great help with the collection and input of the data. My special gratitude I want to give to prof. dr. Rinie Geenen (supervisor of this research) for the devoted and always motivating guidance through the process of writing this thesis.

Introduction

Over the last several decades there has been a growing interest in the psychological construct of body image (Sarwer & Steffen, 2015). Body image has been shown to be associated with obesity (Schwartz & Brownell, 2004). Obesity is a major risk factor for major health issues and can have severe psychological impact (Schwartz & Brownell, 2004). So understanding body image in relation to obesity may contribute to comprehension of the etiology and maintenance of obesity and may help in improving care. Body image dissatisfaction has been shown to be correlated with high body weight and weight loss after bariatric surgery was observed to be associated with improvements in body image (Sarwer & Steffen, 2015).

This thesis examines body image in people with morbid obesity who are admitted to bariatric surgery. Body image has been defined as *'the multifaceted psychological experience of embodiment, especially but not exclusively one's physical appearance. It encompasses one's body-related self-perceptions and self-attitudes, including thoughts, beliefs, feelings and behaviors'* (Cash, 2004).

Worldwide obesity has more than doubled since 1980 and most of the world's population live in countries where overweight and obesity kills more people than underweight (World Health Organization, 2015). Also in the Netherlands there are a lot of overweight and (morbid) obese individuals; 40% of the Dutch adults is overweight, 10% is obese, and 1.5% is morbidly obese (Gezondheidsraad, 2003). In scientific research the threshold value for overweight and obesity is based on the Body Mass Index (BMI), with a BMI greater than or equal to 25 kg/m² is overweight, a BMI greater than or equal to 30 is obesity and a BMI greater than or equal to 40 is morbid obesity (World Health Organization, 2015).

Health and psychological risks

Obesity is associated with several medical comorbidities (Gezondheidsraad, 2003) such as type 2 diabetes, hypertension and sleep apnea (Gilmartin, Long & Soldin, 2013). Also cancer, cardiovascular diseases and gall diseases are more common in people with obesity (Gezondheidsraad, 2003). Obesity costs society a lot. There are direct costs, such as weight-loss drugs and expenditures on medical services, and indirect costs, such as lost wages due to missing work because of obesity-related illnesses and early retirement (Zhang & Rashad, 2008).

Besides costs to society obesity can have serious consequences in the life of individuals who suffer from it. Obesity is associated with a broad range of psychological issues including psychopathology. People with obesity suffer with impairments in quality of life, regardless of whether or not they are suffering with formal psychopathology (Sarwer, Lavery & Spitzer, 2012). Obese patients in general have higher levels of stress, anxiety, depression, food craving and binge eating disorder (BED) symptoms and lower levels of self-esteem and quality of life (Abilés, Rodríguez-Ruiz, Abilés, Mellado, García, Pérez de la Cruz, Fernández-Santaella, 2010). Beyond psychological effects, such as levels of stress and mood, obesity can result in outright discrimination. Obese people experience disadvantages in education, employment and health care settings, and possibly in court in matters such as jury selection and whether or not people are allowed to adopt children (Schwartz & Brownell, 2004). So obesity is a serious problem with several implications for public and individual health.

Bariatric surgery

Treatment of morbid obesity can be through surgery and should be considered when nonsurgical methods of weight reduction fail and health and psychosocial problems related to obesity are pronounced (Abilés et al., 2010). Bariatric surgery is the treatment of choice for morbid obese individuals and gastric bypass in particular is associated with excellent long-term weight loss (Wadden, Sarwer, Womble, Foster, McGuckin & Schimmel, 2001). Also, improvement in weight-related quality of life was reported by gastric bypass patients as compared to individuals with obesity who did not undergo surgery (Sarwer & Steffen, 2015). Still, even with bariatric surgery around 20% of patients fail to lose enough weight. This failure has been –among other factors– attributed to psychosocial factors (Abilés et al., 2010).

Aim research, research questions and hypotheses

Body image is an important element of psychological well-being and can have an influence on obesity and vice versa suggesting a reciprocal effect. Also other factors, such as self-esteem, cultural standards, stigmatization and education are suggested to have an effect on obesity and body image. More knowledge about predictors of body image and obesity is important for treatment. Also insights into the effectiveness of bariatric surgery can have practical implications for patients themselves and, for instance, the insurance companies who need to determine whether or not to compensate for the surgery.

The aim of this research is to get insight into the concept of body image in relation to morbid obesity, whether body image is different before and after bariatric surgery and whether it can predict weight-loss outcome. In this research, body image comprises of two domains including physical appearance and the importance people with obesity attach to body image. To guide hypotheses, theoretical as well as empirical foundation will be discussed.

The first research question is:

What is the level of body image of patients with morbid obesity before and after bariatric surgery in comparison with the general population?

In relation to obesity there are different factors that influence body image. These influences can be classified at a macro, meso, and micro level.

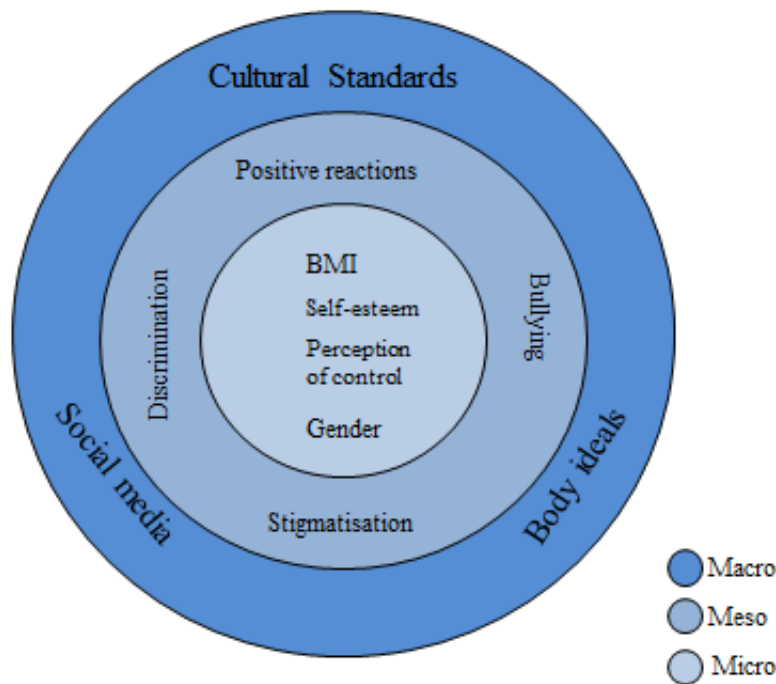


Figure 1

The influence of obesity on body image at a macro, meso and microlevel.

At a macro level, obesity can have an influence on body image due to cultural standards. Physical appearance is important and social media confront people with high standards. A thin body is directly linked to success (the ‘thin ideal’) and those who fail to cultivate this ‘body for success’ are being perceived as less successful (Klaczynski, Goold & Mudry, 2004).

Obesity does not fit in this picture which can be a reason people with obesity become more insecure about their physical appearance and develop a negative body image. Research shows that the more individuals differentiate from the culture's body ideals, the more likely they are to be perceived (by self and peers) as personal failures, and the lower their physical and social attractiveness (Klaczynski et al., 2004).

People with obesity may also experience negative reactions from their surroundings (meso level). A consistent finding within research is that the obese are more negatively stigmatized than almost all other social groups (Klaczynski et al., 2004). Obese people report job discrimination, exploitation by the diet and fitness industry, mistreatment by doctors and public ridicule. They are less likely to be admitted to college or to have their education funded and more likely to be of lower socioeconomic status (Myers & Rosen, 1999). Obesity stigmatization is a frequent and distressing experience that requires considerable coping effort and is related to negative body image (Myers & Rosen, 1999). Cultural standards at macro level determine the reactions from people and in general results in positive reactions to weight-loss (positive confirmation).

At a micro level perception of control over weight is suggested to have an influence on body image. BMI appears to have an influence on body image and this relationship is partially mediated by beliefs in the controllability of one's weight and by valuation of the thin ideal/cultural standards (Klaczynski et al., 2004). Less weight reduction is associated with the beliefs that the weight control is not under behavioral control but has a physical origin (Wamsteker, Geenen, Iekstra, Larsen, Zelissen & Van Staveren, 2005). The belief that the weight cannot be controlled can result in devaluation of themselves ('*I should be in control of my weight but I don't*'). Thus, perceiving that they have no control over their weight may devalue themselves (which can generalize to a more negative body image) because they hold themselves to (unrealistic) high standards and believe they all have to do it by themselves.

Following the model and empirical research the hypothesis for research question 1 is:

The body image of patients will be worse in comparison with the general population and the body image of patients before bariatric surgery will be worse in comparison with patients after bariatric surgery

The second research question is:

What are factors associated with body image before and after bariatric surgery?

In previous research a variety of factors have been associated with body image. In this study besides weight, age, sex and education, also self-esteem will be included because self-esteem is an element a therapist can target. If self-esteem turns out to be a predictor of body image this can have implications for interventions.

According to the psychologist and philosopher William James' (1880), a high self-esteem results from a close match between aspirations, or ideal self-image, and current attainments, or current self-image (French, Story & Perry, 1995). Mediation analyses indicated that, as a result of the treatment, weight loss was both an outcome and mediator of improvements in body-areas satisfaction and physical self-concept (Annesi & Porter, 2015). Research shows that those who are dissatisfied with their bodies have lower self-esteem, regardless of the direction (over- or underweight) of body image dissatisfaction (Furnham, Badmin & Sneade, 2002).

There is some evidence that body image worsened from the lowest to the highest BMI groups (Schwartz & Brownell, 2004). At an individual level body image is affected by whether the person is gaining, losing or maintaining weight with body image improving as the persons (in this case only women) are losing the weight and rebounding to some extent when they regained a small amount of weight (Schwartz & Brownell, 2004). Numerous studies have reported that weight loss after bariatric surgery is associated with marked improvements in body image (Sarwer & Steffen, 2015).

A growing body of research indicates that, in women, body dissatisfaction does not diminish from young adulthood to late adulthood with some research showing women in midlife have higher levels of body dissatisfaction than younger and older cohorts (McLean, Paxton & Wertheim, 2010). Age could have an effect at body image but it is unclear in what way with mixed results within research.

Women in general are significantly less satisfied with their bodies than men, hence simply being female is a risk factor for a negative body image (Schwartz & Brownell, 2004). There are indications that women experience a greater psychosocial burden of obesity in comparison with men (Sarwer & Steffen, 2015).

O’Dea and Caputi (2001) studied the associations between socioeconomic status, weight, age and gender and body image of 6-19 year old children and adolescents. They found that physical self-esteem was lowest among overweight girls of middle/upper SES and greatest among boys of low-SES (O’Dea & Caputi, 2001). So influence of SES seems to differ between boys and girls. Another study found that higher SES, among males and females, was associated with greater weight satisfaction and lower rates of pathological weight control behaviors (Story, French, Resnick & Blum, 1995). Research examining the association between SES and body image is limited.

To summarize, a negative body image results in a worse self-esteem (Furnham et al., 2012), weight loss after bariatric surgery is associated with improvements in body image (Sarwer & Steffen, 2015), women in general are less satisfied with their bodies than men (Schwartz & Brownell, 2004), an age – body image effect is not found (Demarest & Allen, 2000) and the results of the relation between body image and socioeconomic status are limited.

Following empirical research the hypotheses for research question 2 are:

- *A better self-esteem will be associated with a better body image before and after bariatric surgery.*
- *A lower BMI will be associated with a better body image before and after bariatric surgery*
- *Age will not be associated with a better body image before and after bariatric surgery*
- *Men will have a better body image before and after bariatric surgery in comparison to women*

The association between education and body image will be investigated explorative.

The third research question is:

Can body image predict the outcome of weight loss?

The expected mediators when predicting the outcome of weight-loss due to body image are motivation and belief patterns. According to the Health Belief Model (Rosenstock, 1974) an individual’s motivation to undertake a health behavior, such as following a diet, can be divided into three categories: individual perceptions, modifying behaviors, and likelihood of action. A combination of these factors causes a response that manifests into action. So certain

belief patterns have an influence on motivation which in turn influences the ability to lose weight.

Following this model an individual who places great importance to body image will lose more weight, due to a greater motivation, than an individual who does not find body image to be important. When individuals evaluate themselves positive on physical appearance, the motivation to lose weight will decrease and these individuals will lose less weight than individuals who are motivated to lose weight due to a low evaluation on physical appearance. The degree to which individuals invested in physical appearance has been identified as a risk factor for poor body image (Schwartz & Brownell, 2004). Riley and colleagues (1998) studied the relation of self-image to body size and weight loss attempts in black women and found support for the contention that a more positive body image explains their higher prevalence of obesity in comparison with white women because they were less able and less motivated to stick to a diet (Riley, Bild, Cooper, Schreiner, Smith, Sorlie & Thompson, 1998). Also Wertheim and colleagues (1991) found the primary predictor of weight loss behaviors in adolescent boys and girls to be the desire to be thinner which included a larger current body size (Wertheim, Paxton, Maude, Szmukler, Gibbons & Hiller, 1991).

Nevertheless it can be the opposite when individuals evaluate themselves low on physical appearance and lose the motivation to lose weight because of the thought '*I'm already fat, it doesn't matter anymore*'. A small number of individuals report an excessive degree of dissatisfaction with their weight and shape which may negatively impact behavior and causes more psychological distress (Sarwer & Steffen, 2015). But in general, body image dissatisfaction is believed to motivate appearance-enhancing behaviors (Sarwer & Steffen, 2015).

Hence, there could be an interaction-effect within the two domains of body image: individuals who evaluate themselves low on physical appearance and at the same time are placing great importance to body image may have the biggest chance to lose the most weight.

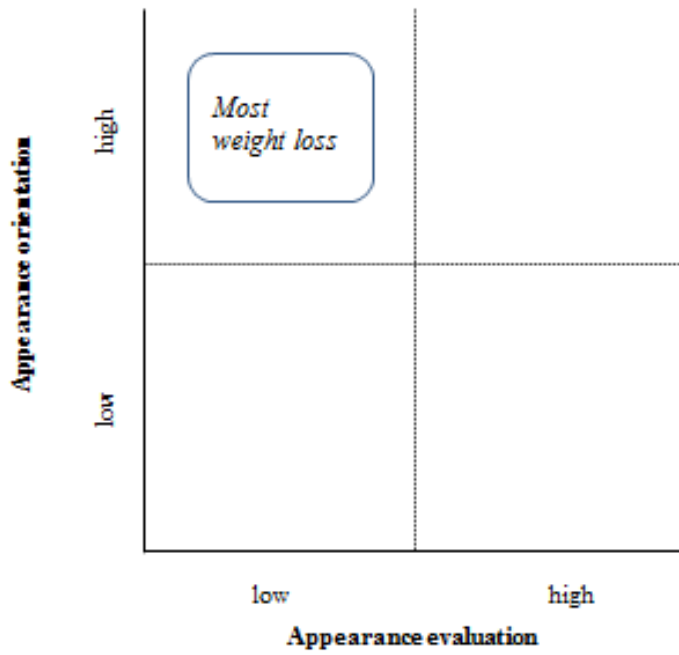


Figure 2

Possible interaction-effect two domains body image and weight-loss

This leads to the last hypotheses:

- *A better body image will be associated with less weight-loss.*
- *A low evaluation on physical appearance and a high importance to physical appearance will result in the most weight-loss.*

Methods

The design of the study was an observational cross-sectional case-control study comparing a group of preoperative patients, a group of postoperative patients and a control group.

Preoperative and postoperative patients

This study included patients on the waiting list for bariatric surgery or patients who already had bariatric surgery at the St. Antonius hospital at Nieuwegein. Patients needed to have a BMI of 40 or higher or a BMI between 35-40 with serious comorbidity to fulfill the requirements for bariatric surgery. Eventually, 160 patients on the waiting list for bariatric surgery filled out the questionnaire and sent it back (preoperative patients) and 269 patients who already had bariatric surgery filled out the questionnaire and sent it back (postoperative). For 27 patients it was unknown whether they filled out the questionnaire before or after bariatric surgery. So, in total, 456 patients were included in this study.

Control group

From march 2007 until june 2008, 41,119 people from the general population participated in research of body image (Woertman & Van den Brink, 2008). Each Participant from the patient group was matched to 4 participants (3.7%) from the general population based on gender, age and education to create a control group. Gender was perfectly matched, age and education could not always be matched perfectly. When a perfect match of age was not possible, a person was matched mostly to someone in the same age category. Age categories were divided into blocks of five years, so when a perfect match was not possible a person was matched, if possible, within a range of five years. If this was not possible, a person was matched to someone nearest in age as possible. From 77 participants in the patient group the education level was unknown and because of that age was left out of the matching procedure. From the participants in the general population 136 were left out before the matching procedure because of a unknown education, gender or age. So, 379 participants from the patient group were matched to 1516 participants from the general population group to create a control group. By accident one person more than planned was included in the control group, so eventually the control group consisted of 1517 participants.

Table 1

Number (n) and percentage of patients before and after surgery and participants from the general population

	<i>n</i>	% of total
Patients	379	83.1
Preoperative	149	39.3
Postoperative	211	55.7
Unknown	19	5.0
Control group	1517	3.69

Procedure

This research is part of a collaboration between the department of Clinical and Health Psychology of Utrecht University and St. Antonius Hospital at Nieuwegein. It is a longitudinal evaluation of the effects of bariatric surgery on patients with morbid obesity. Patients and participants from the general population filled out the MBSRQ and the Rosenberg Self-esteem Scale. Questionnaires were sent to the patients before surgery, less than two years after surgery and more than two years after surgery and they were asked if they wanted to fill out the questionnaire and sent it back to the hospital. Participants signed their informed consent for inclusion in the study. Besides the data obtained from the questionnaires, information of weight and types of surgery were obtained and completed from patient files at the St. Antonius hospital.

Measures

Internal consistency is reported as Cronbach's alpha. Cronbach's alpha values of .70 or higher were considered acceptable (Cronbach, 1951).

Body image

A shortened Dutch version of the Multidimensional Body-Self Relations Questionnaire (MBSRQ) was used to assess participants' body image (Cash, 2000). Its 22 items are divided into three scales: 'appearance evaluation', 'appearance orientation' and 'overweight preoccupation' and are rated on a 5-point scale ranging from 1 (totally disagree) to 5 (totally agree). *The appearance evaluation scale* consists of 7 items reflecting how an individual

judges his or her own physical appearance (e.g., ‘My body is sexually appealing’ and ‘I like the way I look without my clothes’). A high score on this scale reflects a positive judgement of the physical appearance of the self. *The appearance orientation scale* consists of 12 items reflecting how much effort an individual puts into his or her physical appearance (e.g., ‘It is important that I always look good’, and I check my appearance in a mirror whenever I can’). A high score on this scale reflects a great importance to physical appearance while a low score reflects an individual is not spending much time on his or her appearance. The overweight preoccupation scale is not used in this research because this scale has a different meaning for patients in comparison with the general population. It is obvious that patient who want to undergo surgery are preoccupied with their weight. In this research, for ‘appearance evaluation’ the internal consistency was .80, and .87 for appearance orientation.

Self-esteem

The Dutch version of the Rosenberg Self-esteem Scale (Rosenberg, 1965; Woertman, 1994) was used to assess participants’ self-esteem. This questionnaire consists of 10 items (e.g., ‘I feel that I’m a person of worth, at least on an equal basis with others’, and ‘I feel I do not have much to be proud of’). Questions are rated on a 4-point scale ranging from 1 (totally disagree) to 4 (totally agree). A low score reflects a low self-esteem. In this study the internal consistency was .91.

Statistical analysis

Statistical analyses were performed with SPSS for Windows, version 22.0. A *p*-value less than .05 was considered significant (two-tailed). Before analyses it was tested whether gender, age, BMI and education differed significantly between the patients and the control group and between preoperative and postoperative patients using one sample *t*-tests or independent samples *t*-tests.

Body image (appearance evaluation and appearance orientation scores) of patients (pre and post surgery) was compared with the body image of the general population. One samples *t*-tests were used to compare patients with the general population and an independent samples *t*-test was used to compare preoperative and postoperative patients. Cohen’s *d* Effect sizes were calculated to measure the magnitude of differences with values of 0.20, 0.50 and 0.80

representing small, medium and large effects respectively. For the calculation of Cohen's *d* the standard deviation of the control group was used.

Two linear regression analyses were used to test the hypothesis that gender, age, BMI and self-esteem are associated with body image (appearance evaluation and appearance orientation). Also education was added in the analysis because a low education can, in general, be associated with worse outcome. In the analysis for the preoperative patient-group age, gender and education were added in Step 1. In Step 2 the BMI at baseline was added and self-esteem was added in Step 3. For the analysis of the postoperative patient-group also age, gender and education were added in Step 1. The most recent BMI was added in Step 2 and self-esteem was added in Step 3. Dependent variables were appearance evaluation and appearance orientation. The magnitude of the effect of the predictors was described using Cohen's *d* effect sizes.

For the third research question, a multiple regression analyses was performed to test whether body image can be associated with weight-loss outcome. Two multiple regression analyses were performed for the two components of body image with in Step 1 the BMI at baseline, in Step 2 age, gender and education, in Step 3 pre- or post-surgery, and the body image scale (appearance evaluation/appearance orientation) was added in the last step. The magnitude of the effect of these predictors was also described using Cohen's *d* effect sizes. The variables appearance evaluation and appearance orientation were centered and an interaction effect between those variables was examined and putted into the regression analysis.

Results

Descriptives

Table 2 shows demographic characteristics (gender, age, education), BMI and type of surgery of the participants. In the patient group there were 86 men (22.7%) and 293 (77.3%) women compared to 345 (22.7%) men and 1172 (77.3) women in the control group. The age varied between 26 and 74 years for the patient group ($n=379$) and between 26 and 83 years for the control group ($n=1517$). Most of the patients were middle-educated (53.0%) just as the control group (53.0%). The BMI of patients varied between 34.9 and 92.0 and the BMI of the control group varied between 13.8 and 64.8. Only BMI differed significantly between patients and control group ($t(466.47) = 26.26, p < .001$).

Table 2

Demographic characteristics, BMI and type of surgery of patients with morbid obesity (pre and post surgery) and the control group

	Total Patient group	Preoperative patients	Postoperative patients	Control
Gender [n/(%)]				
Male	86 (22.7)	43 (28.9)	41 (19.4)	345 (22.7)
Female	293 (77.3)	106 (71.1)	170 (80.6)	1172 (77.3)
Age (years) [M(SD)]	53.5 (9.70)	52.0 (9.92)	54.6 (9.42)	53.3 (9.83)
BMI [M(SD)]	47.46 (6.90)*	47.21 (7.57)	35.68 (6.55)	25.31 (4.80)
Education [n(%)]				
Low	121 (31.9)	45 (30.2)	68 (32.2)	485 (32.0)
Middle	201 (53.0)	77 (51.7)	115 (54.5)	804 (53.0)
High	57 (15.0)	27 (18.1)	28 (13.3)	228 (15.0)
First surgery [n(%)]				
Gastric bypass	155 (40.9)	103 (69.1)	46 (21.8)	
Gastric band	199 (52.5)	31 (20.8)	158 (74.9)	
Sleeve	22 (5.8)	15 (10.1)	7 (3.3)	

Note*: *this refers to the BMI before surgery*

Body image of patients before and after bariatric surgery in comparison with the general population

In table 3 means and standard deviations of the two body image scales are described for the two patients groups ($n=379$) and the control group ($n=1517$).

Table 3

Means and standard deviations (SD) of appearance evaluation and appearance orientation in patients (pre and post surgery, $n=379$) and in the general population ($n=1517$)

	Appearance evaluation		Appearance orientation	
	Mean	SD	Mean	SD
Patients	2.40	.73	3.38	.72
Pre surgery	2.23	.65	3.31	.72
Post surgery	2.52	.76	3.43	.72
Control group	3.15	.53	3.09	.52

Results show that preoperative patients score significantly lower at appearance evaluation than the general population ($t(147) = -17.08, p < .001, d = -1.55$) Also, they score significantly higher at appearance orientation than the general population ($t(147) = 3.73, p < .001, d = 0.35$).

Postoperative patients also have significantly lower scores at appearance evaluation ($t(209) = -12.02, p < .001, d = -0.96$) and significantly higher scores at appearance orientation ($t(209) = 6.95, p < .001, d = 0.54$) than the control group.

When preoperative and postoperative patients were compared, preoperative patients scored significantly lower at appearance evaluation ($t(147) = -5.40, p < .001, d = -0.41$) and at appearance orientation ($t(147) = -2.09, p = .04, d = -0.17$).

To summarize, patients who underwent surgery, scored better in terms of appearance evaluation than patients before surgery, but it is still a large difference with the general population. Preoperative patients judge their appearance worse than postoperative patients but attach less importance to their appearance than postoperative patients. In comparison with the general population, patients attach significantly more importance to their appearance.

Effect sizes per person were calculated and divided into categories ($-3 = d < -.80$, $-2 = d \geq -.80$ and $< -.50$, $-1 = d \geq -.50$ and $< -.20$, $0 = d \geq -.20$ and $< .20$, $1 = d \geq .20$ and $< .50$, $2 = d \geq .50$ and $< .80$, $3 = d \geq .80$). Figures 1 and 2 are showing how effect sizes within the two body image scales are divided, showing a more skewed distribution for patients than for the control group: patients were more likely to fall into effect size category -3 than the participants from the general population.

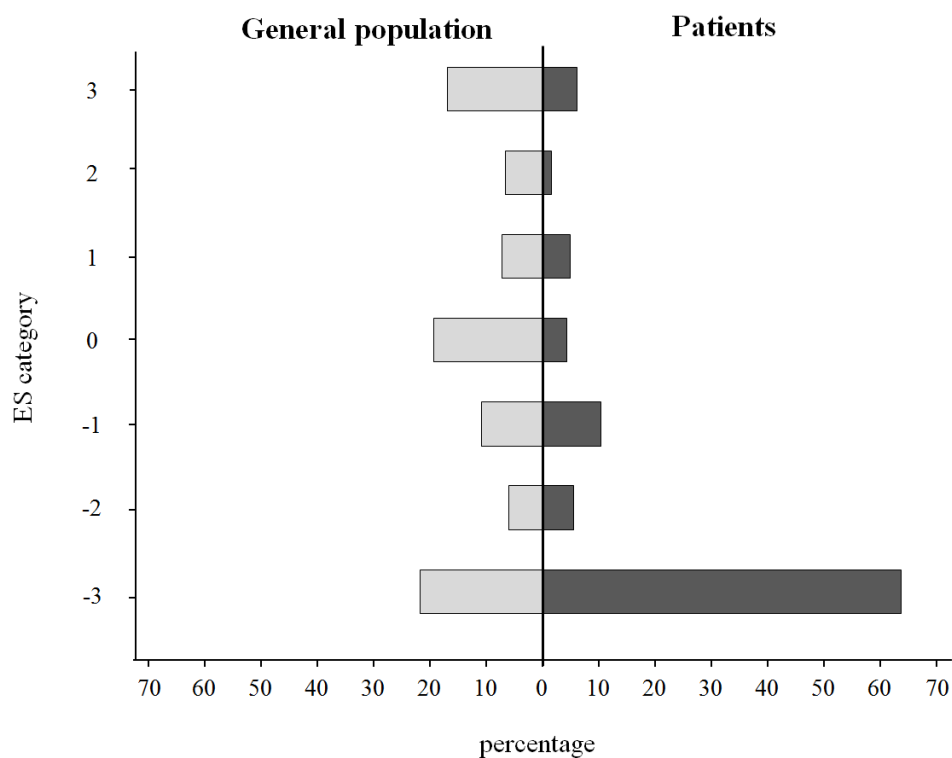


Figure 1

Percentage of patients and participants from the general population scoring from (very) low (category -3) to (very) high (category 3) on appearance evaluation

* $-3 = d < -.80$, $-2 = d \geq -.80$ and $< -.50$, $-1 = d \geq -.50$ and $< -.20$, $0 = d \geq -.20$ and $< .20$, $1 = d \geq .20$ and $< .50$, $2 = d \geq .50$ and $< .80$, $3 = d \geq .80$

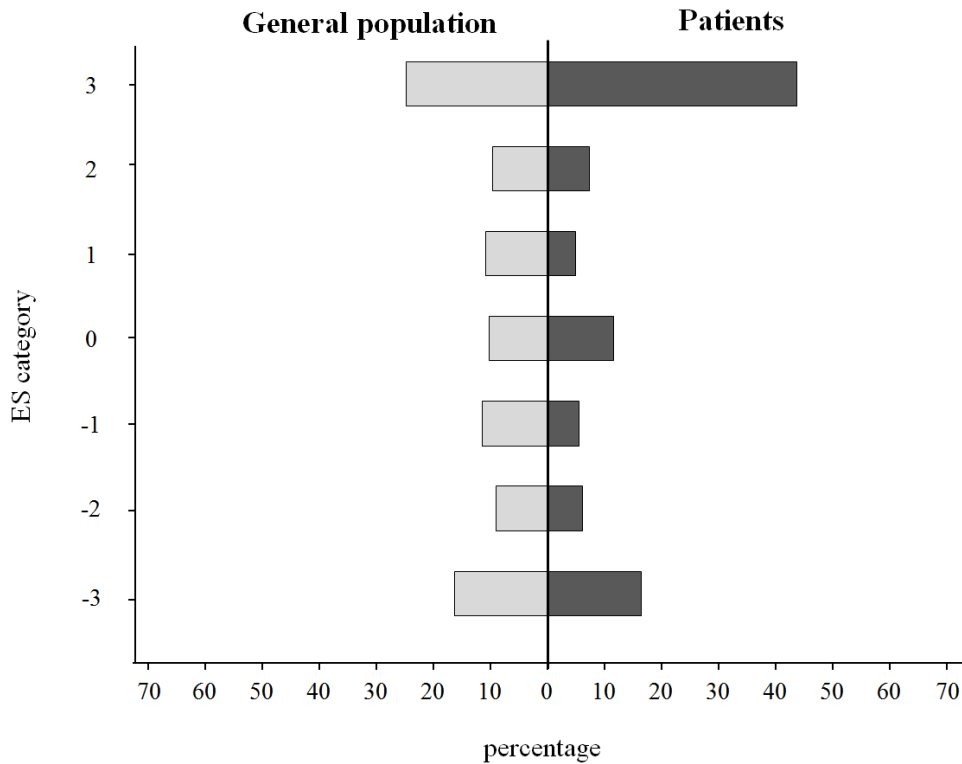


Figure 2

Percentage of patients and participants from the general population scoring from (very) low (category -3) to (very) high (category 3) on appearance orientation

* -3 = $d < -.80$, -2 = $d \geq -.80$ and $< -.50$, -1 = $d \geq -.50$ and $< -.20$, 0 = $d \geq -.20$ and $< .20$, 1 = $d \geq .20$ and $< .50$, 2 = $d \geq .50$ and $< .80$, 3 = $d \geq .80$

Determinants of body image before and after bariatric surgery

The results of the regression analyses predicting body image (appearance evaluation and appearance orientation) before and after bariatric surgery from gender, age, education, BMI and self-esteem are shown in Table 4-7 in the Appendix. First the assumption of multicollinearity was tested. VIF values were all below 10 and the tolerance statistics all above 0.2, indicating no linear relationship between two independent variables in the model.

Predicting appearance evaluation before and after surgery

In model 1 ($t = 2.58, p = .01$) and model 2 ($t = 2.35, p = .02$) gender was an independent predictor for appearance evaluation before surgery: women scored lower on appearance evaluation than men. This prediction disappeared in model 3 when self-esteem was added to

the model. In model 3 appearance evaluation was shown to be independently predicted by self-esteem ($t = 5.07, p < .001$) indicating lower levels of appearance evaluation in patients with low self-esteem (Appendix A, Table 4).

Because gender was a significant predictor in model 1 and 2 but disappeared when self-esteem was added to the model, the interaction between gender and self-esteem was added to the model to examine whether self-esteem played a different role concerning body image for men and women. This interaction was not significant ($t = .63, p = .53$).

After surgery, the variables in model 1 and 2 were not significantly related to appearance evaluation (Appendix B, Table 5). In model 3, appearance evaluation after surgery was shown to be independently predicted by self-esteem ($t = 9.40, p < .001$) indicating lower levels of appearance evaluation in patients with low self-esteem.

Predicting appearance orientation before and after surgery

In model 1 appearance orientation before surgery was shown to be independently predicted by age ($t = -2.04, p = .04$) and gender ($t = -4.28, p < .001$) and in model 2 by gender ($t = -4.12, p < .001$) (Appendix C, Table 6). In model 3, age disappeared as a significant predictor and only gender independently predicted appearance orientation ($t = -3.84, p < .001$), indicating lower levels of appearance orientation in male patients.

After surgery, only the first model predicted a significant proportion of the outcome variance (Appendix D, Table 7). Gender ($t = -6.89, p < .001$) and middle education ($t = 2.60, p = .01$) were significant predictors of appearance orientation in every model, indicating lower levels of appearance orientations in male patients and patients with middle education.

Appearance evaluation and appearance orientation as predictors of weight loss

The results of the regression analyses predicting weight after surgery (thus weight loss because it was corrected for baseline weight) from gender, age, education, BMI, appearance evaluation and appearance orientation are shown in Table 8 and 9.

Predicting weight loss from appearance evaluation and appearance orientation

In both analyses model 1 predicted the most variance of postoperative weight loss ($t = 11.28, p < .001$; $t = 11.28, p < .001$), reflecting that pre- and post-operative weight were correlated (Table 8 and 9). No other variables significantly predicted weight loss, including appearance evaluation ($t = -1.52, p = .13$) and appearance orientation ($t = -0.80, p = .43$).

Table 8

Summary of multiple regression analysis for variables (including appearance evaluation) associated with weight loss (N=346)

	<i>B</i>	<i>SE B</i>	β	Adj <i>R</i> ²
Step 1				.268**
Constant	9.82	2.26		
BMI pre surgery	0.53	0.05	.52**	
Step 2				.265
Constant	8.13	3.06		
BMI pre surgery	0.53	0.05	.52**	
Age	0.02	0.03	.02	
Gender	0.44	0.76	.03	
Low education	1.26	0.97	.09	
Middle education	0.83	0.90	.06	
Step 3				.267
Constant	8.18	3.05		
BMI pre surgery	0.53	0.05	.51**	
Age	0.01	0.03	.02	
Gender	0.57	0.76	.04	
Low education	1.19	0.97	.08	
Middle education	0.75	0.90	.06	
Pre or post-surgery	0.86	0.64	.06	
Step 4				.269
Constant	9.81	3.23		
BMI pre surgery	0.52	0.05	.51**	
Age	0.01	0.03	.02	
Gender	0.73	0.77	.05	
Low education	1.16	0.97	.08	
Middle education	0.70	0.90	.05	
Pre or post-surgery	1.07	0.65	.08	
Appearance Evaluation	-0.66	0.43	-.07	

Notes:

- $R^2 = .27$ for Step 1, $\Delta R^2 = .01$ for Step 2, $\Delta R^2 = .00$ for Step 3, $\Delta R^2 = .01$ for step 4.
 $**p < .001$, $*p < .05$
- Adj. R2 with significance levels of F-change. $* p < 0.05$, $** p < 0.001$

Table 9

Summary of multiple regression analysis for variables (including appearance orientation) predicting weight loss (N=346)

	<i>B</i>	<i>SE B</i>	β	Adj <i>R</i> ²
Step 1				.268**
Constant	9.82	2.26		
BMI pre surgery	0.53	0.05	.52**	
Step 2				.265
Constant	8.13	3.06		
BMI pre surgery	0.53	0.05	.52**	
Age	0.02	0.03	.02	
Gender	0.44	0.76	.03	
Low education	1.26	0.97	.09	
Middle education	0.83	0.90	.06	
Step 3				.267
Constant	8.18	3.05		
BMI pre surgery	0.53	0.05	.51**	
Age	0.01	0.03	.02	
Gender	0.57	0.76	.04	
Low education	1.19	0.97	.08	
Middle education	0.75	0.90	.06	
Pre or post-surgery	0.86	0.64	.06	
Step 4				.266
Constant	9.58	3.52		
BMI pre surgery	0.53	0.05	.51**	
Age	0.01	0.03	.01	
Gender	0.32	0.82	.02	
Low education	1.22	0.79	.09	

Middle education	0.77	0.90	.06
Pre or post-surgery	0.89	0.64	.07
Appearance	-0.37	0.47	-.04
Orientation			

Notes:

- $R^2 = .27$ for Step 1, $\Delta R^2 = .01$ for Step 2, $\Delta R^2 = .00$ for Step 3, $\Delta R^2 = .00$ for step 4.
** $p < .001$, * $p < .05$
- Adj. R2 with significance levels of F-change. * $p < 0.05$, ** $p < 0.001$

An interaction effect between appearance evaluation and appearance orientation was examined and put into the regression analysis. This interaction was not significantly related to weight loss ($t = 1.16$, $p = .25$).

Discussion

The aim of this study was to get insight into the significance of body image for morbid obesity; whether body image was different before and after bariatric surgery and whether it could predict weight-loss outcome. In this study body image comprised the domains physical appearance (appearance evaluation) and the importance people with obesity attach to their physical appearance (appearance orientation).

Body image of patients before and after bariatric surgery in comparison with the general population

Appearance evaluation of patients with morbid obesity improves after bariatric surgery but is still significantly worse in comparison with the general population. This is in line with results from previous studies indicating that body image dissatisfaction is correlated with body weight and that body image improved after bariatric surgery (Sarwer & Steffen, 2015; Schwartz & Brownell, 2004; Klaczynski et al., 2004; Dixon et al., 2002). However, body image measurements after bariatric surgery do not return to normal (Dixon et al., 2002).

What stands out is the fact patients score from very low to very high on appearance evaluation: the whole range is represented. Nevertheless, a large majority of the patients fall within effect size category -3, showing a more skewed distribution for patients than for the control group.

In comparison with the general population, patients attach more importance to their appearance. Preoperative patients attach less importance to their appearance than postoperative patients, which is in line with research of Dixon et al. (2002) who found a decrease in the importance of appearance and presentation for individuals of increasing BMI, especially those in the highest quartile who are predominantly super obese. It could be the case that in patients with the most overweight the thought 'I'm already fat, it doesn't matter anymore' has a larger influence and could lead patients to attach less importance to their appearance. So, there might be a crossover point for weight: being overweight could lead people to attach more importance to their appearance, but being super morbidly obese could result to the opposite.

Again, patients score from very low to very high on appearance orientation, so the whole range is represented. Now a large majority of the patients fall within effect size category +3, showing a more skewed distribution for patients than for the control group.

The body image of patients and the general population differ significantly and a large majority of the patients fall within large effect size categories. These differences could be due to a different interpretation of the questions between patients and the control group. It could be the case patients admitted for bariatric surgery emphasize on their weight in daily life more than people from the general population and because of that have a different interpretation of the questions.

The clinical implication seems to be the existence of a subgroup of patients experiencing problems with their body image. Knowing this, it is important to know what can be done to help these patients.

Determinants of body image before and after bariatric surgery

In this study, women had lower scores on appearance evaluation in comparison with men before surgery which is in line with previous research (Schwartz & Brownell, 2004). After surgery, only self-esteem significantly predicted appearance evaluation: patients with low self-esteem judged their physical appearance worse. Women and patients with low self-esteem appear to be a high risk groups when it comes to body image. Combined it appears that female patients with low self-esteem have the greatest risk of negative appearance evaluation. For treatment it could be effective to focus on those patients.

Within the group of participants with morbid obesity, BMI was not significantly associated with appearance evaluation. It is possible BMI only indirectly influences appearance evaluation, for instance through self-esteem. This outcome seems to indicate when trying to improve someone's appearance evaluation it is not very helpful to exclusively focus on weight. Besides losing weight there must be enough attention for other factors, notably self-esteem.

When it comes to appearance orientation, in this study, men attached less importance to their physical appearance than women. A study of Davis et al. (2000) could explain why mostly women attach a lot of importance to their appearance. They present a theoretical framework that proposes women in our society are regarded to learn to see themselves primarily as objects designed for visual inspection and assessment (Davis et al., 2000).

After surgery also education significantly predicted appearance orientation: patients with a middle-education attach less importance to their physical appearance than low- and highly

educated people. BMI and self-esteem appeared not to be significant factors.

In treatment it could be helpful to take into account that women attach more importance to their appearance in comparison with men and because of that experience their overweight as a bigger burden. This could influence motivation and the course of treatment. Maybe women, because of the importance attached to their appearance, have greater motivation and better treatment outcome. On the other hand, it could be the case women judge themselves more critically which could have a negative influence on treatment outcome.

Appearance evaluation and appearance orientation as predictors of weight loss

Hypotheses with regard to body image as a predictor of weight loss had to be rejected because neither age, gender, education, appearance evaluation and appearance orientation nor the interaction between appearance evaluation and appearance orientation were associated with weight loss. In this study weight loss within two years after surgery had been taken into account. It could be the case body image does not visibly influence weight loss on the short-term, but it possibly does have influence on weight loss on the long-term, which would explain why in this study no significant results could be found. Zijlstra, Larsen, Wouters, Van Ramshorst & Geenen (2013) investigated the long-term course of quality of life and the prediction of weight outcome after bariatric surgery and found a lower mental wellbeing preceded a better weight outcome in the long-term. If this is the case it is important, within treatment, to take into account that the influence of body image on weight loss may not be visible at short-term but becomes obvious at long-term whereby it is still an important variable to keep focused on.

In conclusion, weight loss could not be predicted by age, gender, education and body image, but more research is needed, particularly in the long-term, which will be described next.

Limitations and future research

This study contributed to the research field of body image in people with morbid obesity. Still, this research has some limitations. First the sample mostly consisted of women so the generalizability is questionable. The design was restricted to a short-term prospective cross-sectional comparison while longitudinal studies are needed to determine whether or not obesity precedes low body image, whether a low body image precedes obesity or a third variable explains both. Another reason why longitudinal research is needed is because of the possibility body image changing throughout the years. Previous research showed better body image and more weight loss within the first year after surgery, whereas the weight regain

phase (between one and six years after surgery) was accompanied by a gradual decline in health-related quality of life (Karlsson, Taft, Rydén, Sjöström & Sullivan, 2007). So future research should investigate appearance evaluation and appearance orientation as predictors of weight loss on the long-term.

According to this study BMI is not a predictor of body image. At the same time scientific research results suggesting worse body image for people with increasing BMI. In future research it would be interesting to investigate BMI as a determinant of other variables, for instance self-esteem. If a more indirect influence of BMI on body image could be detected, it is important to know on what variables BMI has an influence so treatment can focus more directly on those variables.

This study population was restricted to patients undergoing bariatric surgery. So this study may not reflect a true cross-section of people with morbid obesity because this study only surveyed those who were seeking help for their condition and underwent bariatric surgery. The results cannot be generalized beyond this group to people with morbid obesity who have no intention to undergo bariatric surgery.

Clearly, the relationships between these and other factors are complex and the relation between body image and variables possibly mediating the relationship, such as education and the perception of weight control, require further investigation.

Implications

Within clinical practice a lot is to be gained when it comes to body image of patients with morbid obesity. According to this study, women and patients with low self-esteem need extra attention when it comes to body image. Second, it seems to be the case that psychological health and physical health need to be addressed separately. For instance, with psychological health (including body image) it does not seem to be profitable to focus on BMI but instead a therapist could try to improve a patients self-esteem and body image. With physical health (weight loss) it seems to be the other way around: a therapist would not make a lot of progress when focusing on body image in that respect.

A construct frequently associated with psychological health and a factor that could mitigate negative body image is self-compassion. Albertson, Neff and Dill-Shackleford (2014) investigated whether a brief 3-week period of self-compassion meditation training would improve body satisfaction within women and found significantly greater reductions in body dissatisfaction, body shame and contingent self-worth based on appearance, as well as greater gains in self-compassion and body appreciation for women in the intervention group

(Albertston et al., 2014). In improving body image in women it could be interesting to investigate if self-compassion meditation may be a cost-effective, useful means to improve the body image of patients with morbid obesity who are admitted to bariatric surgery.

References

- Abilés, V., Rodríguez-Ruiz, S., Abilés, J., Mellado, C., García, A., Pérez de la Cruz, A. & Fernández-Santaella, M.C. (2010). Psychological characteristics of morbidly obese candidates for bariatric surgery. *Obesity Surgery*, *20*, 161-167, DOI: 10.1007/s11695-008-9726-1.
- Albertson, E.R., Neff, K.D., Dill-Shackleford, K.E. (2015). Self-compassion and body dissatisfaction in women: a randomized controlled trial of a brief meditation intervention. *Mindfulness*, 444-454, DOI: 10.1007/s12671-014-0277-3.
- Annesi, J.J. & Porter, K.J. (2015). Reciprocal effects of exercise and nutrition treatment-induced weight loss with improved body image and physical self-concept. *Behavioral Medicine*, *41*, 18-24, DOI: 10.1080/08964289.2013.856284.
- Cash, T. F. (2000). *Manual for the Multidimensional Body-Self Relations Questionnaire*(3rd rev.). Available at <http://www.body-images.com>.
- Cash, T.F. (2004). Body image: past, present, and future. *Body Image*, 1-5, DOI: 10.1016/S1740-1445(03)00011-1.
- Cronbach, L.J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16*, 279-334, DOI: 10.1007/BF02310555.
- Davis, C., Dionne, M. & Shuster, B. (2001). Physical and psychological correlates of appearance orientation. *Personality and Individual Differences*, *30*, 21-30, DOI: 10.1016/S0191-8869(00)00006-4.
- Demarest, J. & Allen, R. (2000). Body image: gender, ethnic, and age differences. *The Journal of Social Psychology*, 465-472, DOI: 10.1080/00224540009600485.
- Dixon, J.B., Dixon, M.E., O'Brien, P.E. (2002). Body image: appearance orientation and evaluation in the severely obese. Changes with weight loss. *Obesity Surgery*, *12*, 65-71, DOI: 10.1381/096089202321144612.
- French, S.A., Story, M. & Perry, C.L. (1995). Self-Esteem and obesity in children and adolescents: a literature review. *Obesity Research*, *3*, 479-490, DOI: 10.1002/j.1550-8528.1995.tb00179.x.
- Furnham, A., Badmin, N. & Sneade, I. (2002). Body image dissatisfaction: gender differences in eating attitudes, self-esteem, and reasons for exercise. *The Journal of Psychology*, *136*, 581-596, DOI: 10.1080/00223980209604820.
- Gezondheidsraad (2003). *Overgewicht en obesitas*. Den Haag: Gezondheidsraad.
- Gilmartin, J. Long, A. & Soldin, M. (2015). Identity transformation and a changed lifestyle following dramatic weight loss and body-contouring surgery: an exploratory study. *Journal of Health Psychology*, *20*, 1318-1327, DOI: 10.1177/1359105313511838.

- Karlsson, J., Taft, C., Rydén, A., Sjöström, L. & Sullivan, M. (2007). Ten-year trends in health-related quality of life after surgical and conventional treatment for severe obesity: the SOS intervention study. *International Journal of Obesity*, 31, 1248-1261, DOI: 10.1038/sj.ijo.0803573.
- Klaczynski, P.A., Goold, K.W. & Mudry, J.J. (2004). Culture, obesity stereotypes, self-esteem, and the 'thin ideal': a social identity perspective. *Journal of Youth and Adolescence*, 33, 307-317, DOI: 10.1023/B:JOYO.0000032639.71472.19.
- McLean, S., Paxton, S.J. & Wertheim, E.H. (2010). Factors associated with body dissatisfaction and disordered eating in women in midlife. *International Journal of Eating Disorders*, 43, 527-536, DOI: 10.1002/eat.20737.
- Myers, A. & Rosen, J.C. (1999). Obesity stigmatization and coping: relation to mental health symptoms, body image, and self-esteem. *International Journal of Obesity*, 23, 221-230, DOI: 10.1038/sj.ijo.0800765.
- O'Dea, J. & Caputi, P. (2001). Association between socioeconomic status, weight, age and gender, and the body image and weight control practices of 6- to 19-year-old children and adolescents. *Health Education Research*, 16, 521-532, DOI: 10.1093/her/16.5.521.
- Riley, N.M., Bild, D.E., Cooper, L., Schreiner, P., Smith, D.E., Sorlie, P. & Thompson, J.K. (1998). Relation of self-image to body size and weight loss attempts in black women. *American Journal of Epidemiology*, 148, 1062-1068, DOI: 10.1093/oxfordjournals.aje.a009583.
- Rosenberg, M. (1979). *Conceiving the Self*. New York: Basic Books.
- Rosenstock, I.M. (1974). The health belief model and preventive health behavior. *Health Education Monographs*, 2, 354-386, DOI: 10.1177/109019817400200405.
- Sarwer, D.B., Lavery, M. & Spitzer, J.C. (2012). A review of the relationships between extreme obesity, quality of life, and sexual function. *Obesity Surgery*, 22, 668-676, DOI: 10.1007/s11695-012-0588-1.
- Sarwer, D.B. & Steffen, K.J. (2015). Quality of life, body image and sexual functioning in bariatric surgery patients. *European Eating Disorders Review*, 23, 504-508, DOI: 10.1002/erv.2412.
- Schwartz, M.B. & Brownell, K.D. (2004). Obesity and body image. *Body Image*, 43-56, DOI: 10.1016/S1740-1445(03)00007-X.
- Story, M., French, S.A., Resnick, M.D. & Blum, R.W. (1995). Ethnic/racial and socioeconomic differences in dieting behaviors and body image perceptions in adolescents. *International Journal of Eating Disorders*, 18, 173-179, DOI: 10.1002/1098-108X(199509)18:2<173::AID-EAT2260180210>3.0.CO;2-Q.
- Wamsteker, E.W., Geenen, R., Iestra, J., Larsen, J.K., Zelissen, P. M. J. & Van Staveren, W.A. (2005). Obesity-related beliefs predict weight loss after an 8-week low-calorie

- diet. *Journal of the American Dietetic Association*, 105, 441-444, DOI: 10.1016/j.jada.2004.12.031.
- Wadden, T.A., Sarwer, D.B., Womble, L.G., Foster, G.D., McGuckin, B.G. & Schimmel, A. (2001). Psychosocial aspects of obesity and obesity surgery. *Obesity Surgery*, 5, 1001-1024, DOI: 10.1016/S0039-6109(05)70181-X.
- Wertheim, E.H., Paxton, S.J., Maude, D., Szmukler, G.I., Gibbons, K. & Hiller, L. (1992). Psychosocial predictors of weight loss behaviors and binge eating in adolescent girls and boys. *International Journal of Eating Disorders*, 12, 151-160, DOI: 10.1002/1098-108X(199209)12:2<151::AID-EAT2260120205>3.0.CO;2-G.
- Woertman, L. & Van Den Brink, F. (2008). Tevreden met het uiterlijk, maar de perfectie lokt. *Psychologie en Gezondheid*, 36, 262-271, DOI: 10.1007/BF03077514.
- World Health Organization (2015). *Obesity: preventing and managing the global epidemic*. Genève: World Health Organization.
- Zhang, L. & Rashad, I. (2008). Obesity and time preference: the health consequences of discounting the future. *Journal of Biosocial Science*, 40, 97-113, DOI: 10.1017/S0021932007002039.
- Zijlstra, H., Larsen, J.K., Wouters, E.J.M., Van Ramshorst, B. & Geenen, R. (2013). The long-term course of quality of life and the prediction of weight outcome after laparoscopic adjustable gastric banding: a prospective study. *Bariatric Surgical Patient Care*, 8, 18-22, DOI: 10.1089/bari.2013.9998.

Appendix A

Table 4

Summary of linear regression analysis for variables associated with appearance evaluation before surgery (N=148)

	<i>B</i>	<i>SE B</i>	β	<i>Adj R²</i>
Step 1				.054*
Constant	1.84	0.31		
Age	0.01	0.01	.12	
Gender	0.31	0.12	.21*	
Low education	-0.14	0.16	-.10	
Middle education	-0.14	0.15	-.11	
Step 2				.062
Constant	2.41	0.49		
Age	0.01	0.01	.10	
Gender	0.28	0.12	.20*	
Low education	-0.12	0.16	-.08	
Middle education	-0.14	0.15	-.10	
BMI pre surgery	-0.01	0.01	-.13	
Step 3				.203**
Constant	1.22	0.51		
Age	0.00	0.01	.07	
Gender	0.17	0.11	.12	
Low education	0.05	0.15	.04	
Middle education	0.01	0.14	.01	
BMI pre surgery	-0.01	0.01	-.13	
Self-esteem	0.04	0.01	.40**	

Notes:

- $R^2 = .08$ for Step 1, $\Delta R^2 = .02$ for Step 2, $\Delta R^2 = .14$ for Step 3 ** $p < .001$, * $p < .05$
- Adj. R2 with significance levels of F-change. * $p < 0.05$, ** $p < 0.001$

Appendix B

Table 5

Summary of linear regression analysis for variables associated with appearance evaluation after surgery (N=210)

	<i>B</i>	<i>SE B</i>	β	Adj <i>R</i> ²
Step 1				-.007
Constant	2.55	0.36		
Age	-0.00	0.01	-.02	
Gender	0.22	0.14	.11	
Low education	0.03	0.18	.02	
Middle education	0.01	0.17	.01	
Step 2				-.007
Constant	2.84	0.45		
Age	-0.00	0.01	-.02	
Gender	0.23	0.14	.12	
Low education	0.05	0.18	.03	
Middle education	0.02	0.17	.02	
BMI recent	-0.01	0.01	-.07	
Step 3				.303**
Constant	0.85	0.43		
Age	-0.00	0.01	-.05	
Gender	0.10	0.12	.05	
Low education	-0.00	0.15	-.00	
Middle education	-0.04	0.14	-.03	
BMI recent	-0.01	0.01	-.07	
Self-esteem	0.07	0.01	.56**	

Notes:

- $R^2 = .01$ for Step 1, $\Delta R^2 = .01$ for Step 2, $\Delta R^2 = .31$ for Step 3
** $p < .001$, * $p < .05$
- Adj. R2 with significance levels of F-change. * $p < 0.05$, ** $p < 0.001$

Appendix C

Table 6

Summary of linear regression analysis for variables associated with appearance orientation before surgery (N=146)

	<i>B</i>	<i>SE B</i>	β	<i>Adj R²</i>
Step 1				.142**
Constant	4.18	0.33		
Age	-0.01	0.01	-.16*	
Gender	-0.54	0.13	-.34**	
Low education	0.02	0.17	.01	
Middle education	-0.23	0.15	-.16	
Step 2				.139
Constant	3.90	0.51		
Age	-0.01	0.01	-.15	
Gender	-0.52	0.13	-.33**	
Low education	0.01	0.17	.00	
Middle education	-0.24	0.15	-.16	
BMI pre surgery	0.01	0.01	.06	
Step 3				.140
Constant	4.19	0.59		
Age	-0.01	0.01	-.15	
Gender	-0.50	0.13	-0.31**	
Low education	-0.03	0.17	.02	
Middle education	-0.27	0.16	-.19	
BMI pre surgery	0.01	0.01	.06	
Self-esteem	-0.01	0.01	-.09	

Notes:

- $R^2 = .17$ for Step 1, $\Delta R^2 = .00$ for Step 2, $\Delta R^2 = .01$ for Step 3
** $p < .001$, * $p < .05$
- Adj. R2 with significance levels of F-change. * $p < 0.05$, ** $p < 0.001$

Appendix D

Table 7

Summary of linear regression analysis for variables associated with appearance orientation after surgery (N=202)

	<i>B</i>	<i>SE B</i>	β	<i>Adj R²</i>
Step 1				.212**
Constant	3.36	0.30		
Age	0.00	0.01	-.00	
Gender	-0.82	0.12	-.44**	
Low education	0.18	0.15	.11	
Middle education	0.35	0.14	.24*	
Step 2				.213
Constant	3.61	0.38		
Age	0.00	0.01	-.00	
Gender	-0.82	0.12	-.44**	
Low education	0.19	0.15	.13	
Middle education	0.36	0.14	.25*	
BMI recent	-0.01	0.01	-.07	
Step 3				.209
Constant	3.56	0.44		
Age	0.00	0.01	-.00	
Gender	-0.82	0.12	-.44**	
Low education	0.19	0.15	.13	
Middle education	0.36	0.14	.25*	
BMI recent	-0.01	0.01	-.07	
Self-esteem	0.00	0.01	.02	

Notes:

- $R^2 = .23$ for Step 1, $\Delta R^2 = .00$ for Step 2, $\Delta R^2 = .00$ for Step 3.
** $p < .001$, * $p < .05$
- Adj. R2 with significance levels of F-change. * $p < 0.05$, ** $p < 0.001$