

**Cognitive and emotional processes that  
promote and obstruct  
a successful outcome  
after bariatric surgery for morbid obesity**

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**Cognitive and emotional processes that  
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**Cognitieve en emotionele processen die  
een succesvolle uitkomst  
na bariatrische chirurgie voor morbide obesitas  
bevorderen en belemmeren**

*(met een samenvatting in het Nederlands)*

Proefschrift

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# Contents

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Chapter 1	General Introduction	7
Chapter 2	Patients' explanations for unsuccessful weight loss after Laparoscopic adjustable gastric banding (LAGB)	21
Chapter 3	Emotion processing and regulation in women with morbid obesity who apply for bariatric surgery	39
Chapter 4	The association between weight loss and self-regulation cognitions before and after laparoscopic adjustable gastric banding for obesity: A longitudinal study	57
Chapter 5	Initiation and maintenance of weight loss after laparoscopic adjustable gastric banding. The role of outcome expectation and satisfaction with the psychosocial outcome	69
Chapter 6	The long-term course of quality of life and the prediction of weight outcome after laparoscopic adjustable gastric banding. A prospective study	83
Chapter 7	Conversion to gastric bypass in patients with unsuccessful weight loss after gastric banding may depend on mental quality of life	95
Chapter 8	Summary and General Discussion	105
	Samenvatting (Dutch summary)	121
	Dankwoord (Acknowledgements)	129
	Curriculum Vitae	135
	Publications	139

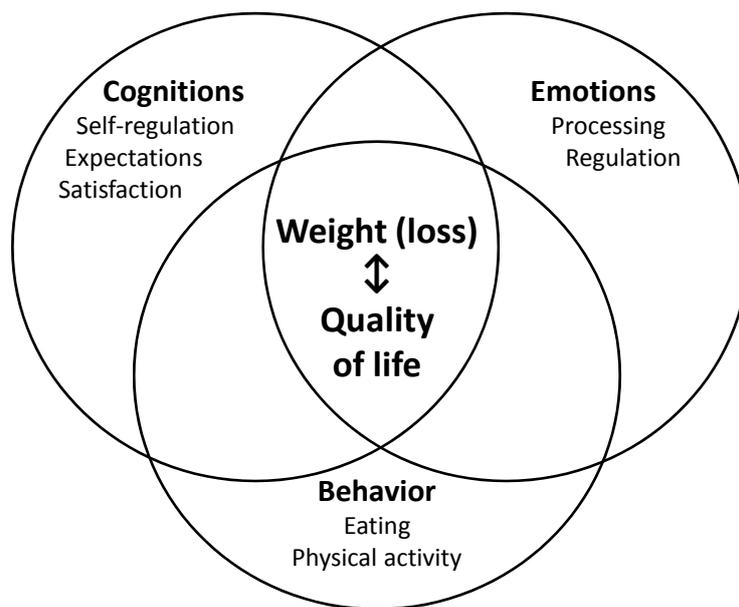


# **Chapter 1**

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## **General Introduction**

This thesis examines cognitive and emotional factors that may promote or obstruct a successful outcome after weight loss surgery for severe obesity. The research field of psychological aspects of weight loss surgery has been named bariatric psychology [1]. The main themes of this field, cognitions, emotions and behavior, are depicted in figure 1. Before discussing these themes and the outline of this thesis, obesity is defined and its' treatment is discussed.



**Figure 1.** Overview of the themes of this thesis

## **MORBID OBESITY: DEFINITION AND TREATMENT**

Obesity is characterized by excessive fat accumulation that contributes to chronic diseases such as diabetes mellitus, hyperlipidemia, hypertension, cardiovascular diseases, sleep apnea, cancer, and depression [2], and to stigmatization [3], severely reduced quality of life [4], and early mortality [5].

The most commonly used classification for overweight and obesity in the adult population is the Body Mass Index (BMI). This index of weight-for-height is defined as the weight in kilograms divided by the square of the height in meters ( $\text{kg}/\text{m}^2$ ). The World Health Organization (WHO) distinguishes six BMI categories. A BMI below 18.5 is defined as underweight, between 18.5 and 24.9 as normal weight, between 25.0 and 29.9 as

pre-obesity, between 30.0 and 34.9 as obesity class I, between 35.0 and 39.9 as obesity class II, and above 40 as obesity class III, also mentioned 'morbid obesity'. The BMI categories are risk indicators of diseases, with morbid obesity giving the highest risk at body weight related diseases [6].

Obesity is a worldwide epidemic health problem [7]. The prevalence of obesity is increasing throughout the world. Results from the U.S.A. indicate that in 1976-1980 an estimated 32% of adults aged 20 years and over was pre-obese ( $25 \leq \text{BMI} \leq 29.9$ ) and 34% in 2007-2008; in 1976-1980 15% was obese ( $30.0 \leq \text{BMI} \leq 39.9$ ) and 34% in 2007-2008; and in 1976-1980 1,4% was morbid obese ( $\text{BMI} \geq 40$ ) and 6% in 2007-2008 [8]. In the Netherlands the prevalence of pre-obesity, obesity and morbid obesity (together defined as  $\text{BMI} \geq 25$ ) increased the last three decades for women from 29% in 1981 to 42% in 2009 and for men from 37% in 1981 to 52% in 2009; obesity and morbid obesity (defined as  $\text{BMI} \geq 30$ ) increased for women from 5% in 1981 to 13% in 2009, and for men from 3% in 1981 to 11% in 2009 [9].

Surgery is considered the treatment of choice for morbid obesity [10]. In 1991, the American National Institutes of Health established guidelines for the surgical therapy for morbid obesity ( $\text{BMI} \geq 40$  or  $\text{BMI} \geq 35$  in the presence of significant co-morbidities) referred to as 'bariatric surgery' [10]. In 2010, gastric banding and gastric bypass were used in more than 90% of the bariatric operations. The proportion of the two operations varies from more than 95% gastric banding in Australia, about 50% for each procedure in Europe and USA, and nearly 100% gastric bypass in South America [11].

Bariatric surgery treatments can be broken down into restrictive, malabsorptive and combined restrictive and malabsorptive procedures. Restrictive procedures involve limitation of food intake and malabsorption is preventing absorption of food. Laparoscopic adjustable gastric banding (LAGB) is a restrictive form of bariatric surgery designed to induce weight loss by limiting food consumption. In this procedure a silicone band is fastened around the upper part of the stomach. The inner surface of the band is inflatable and connected by a thin silicone tube to an access port. This allows postoperative stomach size adjustment by puncturing the port and injecting or withdrawing a saline solution [12]. Gastric bypass is a combined restrictive and malabsorptive procedure in which the upper portion of the stomach is stapled to create a small (10-30 ml) reservoir that attaches directly to the middle section of the small intestine (jejunum) via a Roux-en-Y limb. The restricted capacity of the gastric pouch severely limits food intake, while bypassing the stomach and upper portions of the small intestine inhibits the absorption of some nutrients [13]. Bariatric surgery not only induces weight loss because of limitation of food intake or preventing absorption of food, but also by induction of satiety, change of taste, neural and hormonal mediation and aversion of food [11]. Weight loss after bariatric surgery is

commonly reported as the percentage of excess body mass index lost. Excess Body mass index Lost (%EBL) is calculated through the formula [14]:

$$\%EBL = (\text{preoperative BMI} - \text{current BMI}) / (\text{preoperative BMI} - 25) \times 100$$

## **OUTCOME OF BARIATRIC SURGERY**

The mean percentage of excess body mass index lost is 49,4% after gastric banding and 62,6% after gastric bypass [15]. At five years after gastric banding or gastric bypass, there is a loss of 30 to 35 kg representing 50 to 60% loss of excess body mass index. This weight loss has been shown to be associated with major improvement or complete resolution of multiple common and serious health problems, improvement of quality of life, and survival [11]. Several co-morbidities partly or completely resolve [16]: Diabetes is completely resolved in 77% of the patients and resolved or improved in 86%, hyperlipidemia improves in 70% or more of the patients, hypertension is resolved in 62% of the patients and resolved or improved in 79%, obstructive sleep apnea is resolved in 86% of the patients and is resolved or improved in 84% of the patients. Just after surgery most patients experience improvements in quality of life [17-23]. The long-term quality of life outcome is, however, not clear. Some results support a decline in quality of life at long-term follow-up [24,25], but other results suggest no differences in quality of life between the short-term and long-term follow-up [22].

## **PSYCHOLOGICAL DETERMINANTS**

Although bariatric surgery is considered the treatment of choice for morbid obesity [26], not all patients achieve a successful weight outcome [16,27,28]. The outcome of bariatric surgery, especially of restrictive types such as gastric banding, depends not only on the technical adequacy of the surgical procedure, but also on the degree to which the patient adopts healthy and enduring changes in behavior. A number of patients fails to adopt healthy and enduring dietary and physical activity changes [29,30].

In the past decades, scholars examined whether preoperative psychological risk factors are associated with outcome after bariatric surgery. Generally, the data suggest a lack of a clear relationship between preoperative factors and weight loss after surgery [31,32], while postoperative psychological variables have been indicated to be associated with a poor weight outcome [33,34]. Thus, perhaps the operation is necessary to be able to

discover who will and who will not achieve a poor outcome. Besides pre-surgical psychological variables also a favorable psychological status after the operation is needed to maintain weight loss changes postoperatively.

Two aspects characterize studies on preoperative psychological factors. First, most studies did not include long-term weight outcome. It is known that in the first year after surgery most patients are in a kind of honeymoon phase in which they lose a lot of weight and functioning and well-being increase a lot. However, from 18 months onwards maintenance of the lower weight is the main aim instead of weight loss. This weight loss maintenance phase appears to be difficult for some patients. It is possible that pre-surgical psychological factors are associated with longer-term outcome. Second, most studies focused on eating behavior (binge eating) and depression, while cognitions and emotion regulation are neglected as potential risk factors. However, both cognitions and emotion regulation are considered to underlie health behaviors and depression. The premise of this thesis is that the appropriate tools to improve the outcome of bariatric surgery are found by examining cognitive and emotional factors that impact on eating behavior of patients after bariatric surgery.

## **Cognitive factors**

Several cognitive factors may underlie patients' changes in health behavior. This paragraph outlines two complementary cognitive theories.

### *Self-regulation model*

Behavioral actions needed to manage health threats depend on self-regulation cognitions: the beliefs about one's capability to regulate health behavior and the course of an illness. Interventions aimed at weight loss and changing self-regulation cognitions have been associated with improvement of eating behavior and weight loss of obese persons [35-38]. Apart from being a potential predictor of the outcome of bariatric surgery, successful weight loss after surgery could change obesity-related self-regulation cognitions. The resulting positive cognitive changes may further support weight loss. Few studies investigated whether self-regulation cognitions are predictors of outcome after laparoscopic adjustable gastric banding and whether these cognitions change as a consequence of the operative procedure. Such a study is useful, because cognitions could be targeted in cognitive-behavioral therapy.

### *Outcome expectations*

Patients who expect a positive outcome of a certain behavior and who are more satisfied with an outcome of a behavior are more prone to execute this behavior in the future. Several models in the area of health psychology incorporated this knowledge from learning theory and proposed that health behavior may depend on outcome expectations and satisfaction with outcomes. One model is based on the premise that the initiation and maintenance of behavior change involve different decision processes [39]. Positive expectations about the consequences of behavior change are thought to guide the initiation of health behavior, whereas satisfaction with the outcomes guides decisions on maintenance of health behavior [40].

As in the learning principle negative reinforcement, it has been challenged that predominantly positive aspects of outcomes –such as satisfaction– are a motivation for health behavior change. The Health belief model states that an observed threat of one’s health can motivate individuals to behave healthier. From this theory it can be expected that distress and decreased functioning, thus a lower quality of life, motivate individuals to initiate more healthier behavior [41]. To improve the outcome of bariatric surgery by targeting cognitions, it is worthwhile to disentangle the prognostic effects of outcome expectation and satisfaction as well as of unfulfilled expectation.

### *Quality of life*

Although quality of life is often assessed as a secondary outcome measure after bariatric surgery, it could also be considered a cognitive variable predicting health behavior. It is possible that a low quality of life obstruct health behavior, because of a shortage of will-power or self-efficacy, the judgment of one’s capability to accomplish a desired effect such as to regulate one’s eating behavior [10]. In contrast, according to the Health belief model [41], the perceived threat of a disease and the perceived benefits versus barriers to behavioral change determine the likelihood of behavioral change. Some researchers use all of the components of this model, while others use selected parts. In this thesis, we focus on ‘the perceived threat’ component. We hypothesize that a lower quality of life may be ‘a threatening cue to action’, i.e., a signal that a change of health status is needed, while a good quality of life may be a signal that no further action is needed. In line with this notion, lower levels of quality of life have been associated with treatment-seeking behavior in obesity [42]. It is as yet unexplored whether quality of life is a predictor of the weight outcome in patients with morbid obesity after bariatric surgery.

## **Emotional factors**

Beside behavior and cognitions, emotions and the processing and regulation of negative emotions are considered possible determinants of eating behavior.

Negative emotions such as depressive symptoms, run in morbid obesity [43]. Depressive symptoms may be indicative of more severe psychological problems and disturbed cognitions. An influential theoretical model, the limited strength model, proposes that self-regulation problems in one sphere (e.g., regulating negative affect) diminishes the resources available for self-regulation in other spheres [44]. Moreover, according to affect regulation models, depressed individuals overeat in an effort to provide distraction from negative feelings [45]. These models may explain how the presence of depressive symptoms is linked with increased weight through disordered eating or decreased physical activity. There is some literature -providing mixed evidence- on the predictive value of depressive symptoms for weight outcome in bariatric surgery patients. Some studies found that depressive symptoms predicted a better weight outcome [46,47], other studies found no evidence for the predictive value of depressive symptoms [48-50], and still other studies found that depression predicted a worse weight outcome, but these studies measured depressive disorder instead of depressive symptoms [51-53]. Notably, all studies that did not find evidence for a prospective association between depression and weight outcome had a relatively short-term follow-up.

A higher body weight, particularly morbid obesity, has been associated with emotional eating, the tendency to eat when experiencing negative affect [54,55]. Emotional eating has been observed with such divergent emotions as depression, anger, anxiety, and shame [56-60]. It may indicate that general ways to process and regulate emotions are disturbed, which has been indicated in some studies [45,55,61,62].

This thesis differentiates between the processing and regulation of emotions. Emotion processing refers to rather stable, automated actions that determine the type and strength of emotional experiences, while emotion regulation includes mostly intentional action plans to deal with resulting emotions [63,64]. Some types of emotion processing and regulation are considered healthy [65-67], but others are considered risk factors for emotional maladjustment [68-70]. Previous studies on obesity predominantly focused on unhealthy processing and regulation of emotions. It is important to know whether the healthy regulation of emotions is also disturbed.

## **AIM AND OUTLINE OF THE THESIS**

The aim of this thesis is to examine cognitive and emotional processes that promote and obstruct a successful outcome after bariatric surgery for morbid obesity. This study may offer tools to tailor postoperative education and therapy to patients with a psychological high-risk profile for an adverse outcome. This will reduce co-morbidity and improve the long-term weight outcome and quality of life.

This thesis includes six studies with a cross-sectional or prospective design. The models of assessment used are semi-structured interviews, self-report questionnaires, and assessments of weight outcome after weight loss induced by an operation. Repeated assessments were taken six months before, and six months, one year, and each next year after operation.

Chapter 2 is a descriptive qualitative study examining patients' explanations for unsuccessful weight loss after bariatric surgery with particular emphasis on awareness of their own role in controlling food intake and on self-efficacy. Patients who achieve insufficient weight loss after bariatric surgery have been generally studied as part of the whole, mostly successful, group that underwent an operation. This qualitative study was unique, because the voices of the unsuccessful patients after LAGB are heard.

In Chapter 3 the emotion processing and regulation in women with morbid obesity who apply for bariatric surgery are investigated. Emotional eating, the tendency to eat when experiencing negative affect, is prevalent in morbid obesity and may indicate that ways to deal with emotions are disturbed. The aim of our study was to examine whether both unhealthy and healthy processing and regulation of emotions differ for people with morbid obesity as compared to people from the general population.

In Chapter 4 the association between self-regulation cognitions (both before and after laparoscopic adjustable gastric banding) and weight loss is examined. For a significant proportion of patients, bariatric operation ends a long period of helpless efforts to lose weight. Positive cognitive changes after the operation may support the weight loss. The purpose of this study was to investigate whether self-regulation cognitions are predictors of outcome after laparoscopic adjustable gastric banding and whether these cognitions change as a consequence of the operative procedure.

Chapter 5 describes the initiation and maintenance of weight loss after laparoscopic adjustable gastric banding, and the role of outcome expectation and satisfaction with the psychosocial outcome. A premise of this study was that different psychological processes predict the initiation and maintenance of weight loss after surgery for morbid obesity. The aim was to examine whether more favorable preoperative expectations of psychosocial outcomes predict weight loss in the first year after laparoscopic adjustable gastric banding

and whether postoperative satisfaction with these outcomes predicts weight maintenance in the second year after the operation.

In the chapters 6 and 7 the predictive value of quality of life for weight outcome is examined. Quality of life is regarded as an important outcome measure besides weight loss and reduced co-morbidity. The purpose of chapter 6 was to examine the course of quality of life one year and six years after LAGB, and to examine whether quality of life one year after LAGB predicts weight outcome at six years postoperatively. Some patients with unsuccessful weight loss after laparoscopic adjustable gastric banding undergo a conversion of gastric banding to gastric by-pass. Chapter 7 examines whether mental quality of life is predictive of conversion to gastric bypass.

In Chapter 8 the results and conclusions of these studies are integrally summarized and discussed, including methodological considerations, directions for future research, and clinical implications.

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## **Chapter 2**

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### **Patients' explanations for unsuccessful weight loss after laparoscopic adjustable gastric banding (LAGB)**

Zijlstra, H., Boeije, H.R., Larsen, J.K., van Ramshorst, B, & Geenen, R.  
Patients' explanations for unsuccessful weight loss after laparoscopic adjustable gastric banding (LAGB). *Patient Education and Counseling* 2009; 75: 108-13.

## **ABSTRACT**

**Objective.** Not all patients with morbid obesity attain sufficient weight loss after laparoscopic adjustable gastric banding (LAGB). We examined patients' explanations for unsuccessful weight loss and self-awareness regarding food-intake.

**Methods.** Interviews with 11 patients (10f/1m; mean age 46 years) with unsuccessful weight loss were transcribed and analyzed with the MAXqda2 program.

**Results.** Interviewees were disappointed with the postoperative outcome. Some showed no awareness of their own role, while others were inefficacious to continue the actions needed to maintain weight loss, especially during times of stress. Typical statements that distinguished interviewees were: 'It didn't work out', 'I don't care anymore', 'I know I have to do it', 'I know I can do it'.

**Conclusion.** Some patients with unsuccessful weight loss after LAGB are insufficiently aware that their own effort is needed to maintain weight loss. Others have self-awareness, but find it difficult to turn awareness into action.

**Practice implications.** This group could perhaps be helped by tailoring postoperative guidance to the stage of change of an individual patient. Counseling could include increasing awareness of the need to self-control eating and offering assistance to turn intentions into action and to deal with stress, emotions and physical problems.

## INTRODUCTION

Morbid obesity, a body mass index (BMI) of more than 40 kg/m<sup>2</sup>, is a life-threatening condition with significant co-morbidity [1] and severely reduced quality of life [2]. Bariatric surgery generally results in dramatic reduction of weight and obesity-related co-morbidity [3, 4], improvement of functioning and quality of life [5-7], and a change in patients' relationship with food and perception of control over eating [8]. Although most patients benefit from bariatric surgery, not all patients achieve a successful weight outcome. Our study focuses on patients' explanations for lack of success.

The outcome of restrictive types of bariatric surgery such as laparoscopic adjustable gastric banding (LAGB) depends on the degree to which the patient succeeds in adopting healthy and enduring dietary changes. These changes are intertwined with beliefs about one's capability to control eating and obesity [9, 10]. Paradoxically, patients with successful weight loss after LAGB, described feeling better able to self-manage their weight after relinquishing control to the gastric band [11]. However, anxiety may arise after surgery and skills related to dealing with emotions may change [12]. Emotions and poor stress management can hinder the control of food [11, 13, 14]. To be able to help patients with an unsatisfactory outcome after LAGB, it is important to gain insight into the patients' awareness of their own role in controlling food intake and into the patients self-efficacy (one's self-perceived capability to accomplish a desired effect such as to regulate one's eating behavior) [15]. Both 'being aware of one's own role in controlling food intake' and 'being capable to control food intake' are considered important aspects of self-regulation and are related to changes in health behavior [16]. An influential theory of health behavior is the stages of change model that describes the modification of health behavior as a cyclical progression through six stages with frequent relapses [17].

Patients who achieve insufficient weight loss after bariatric surgery have been studied as part of the whole, mostly successful group that underwent an operation [5, 8, 10-12]. Our qualitative study is unique, because the voices of the unsuccessful patients after LAGB are heard. They tell us about their unsuccessful outcome in relation to expectations of the operation and experiences afterwards. Our particular aim was to examine patients' explanations for unsuccessful weight loss with particular emphasis on awareness of their own role in controlling food intake and on self-efficacy.

## **METHODS**

### **Sample**

Between May 2000 and July 2003, 110 patients underwent a LAGB procedure [18] at the St. Antonius Hospital Nieuwegein, the Netherlands, using the Lap-Band system (INAMED Health, Santa Barbara, CA, USA). Surgical indications were a BMI  $\geq 40$  or a BMI between 35 and 40 with serious co-morbidity. Postoperatively, patients visited a nurse for medical and weight assessment and a dietician for diet education.

Unsuccessful weight loss was defined as a BMI  $\geq 40$  and less than 10 BMI points weight loss at the time of the interview and 2 years after the operation when transition from weight loss to weight maintenance had occurred [19, 20]. Of the 24 LAGB patients who fulfilled these criteria (22%), 6 had already had gastric bypass surgery and were excluded, leaving 18 evaluable patients of whom 12 were randomly selected and invited to participate. Eleven agreed and were interviewed 2 to 5 years postoperatively (10 female, 1 male; mean age 46 years [range 30-61]; mean preoperative BMI 50 kg/m<sup>2</sup> [range 46-54] and mean BMI 2 years postoperatively 46 kg/m<sup>2</sup> [range 41-52]). The characteristics of the initial population of 110 patients were: 99 female (90%) and 11 men, mean age 43 years [range 26-63]; mean preoperative BMI 47 kg/m<sup>2</sup> [range 37-61], and mean BMI 2 years postoperative 36 kg/m<sup>2</sup> [range 23-59].

The study protocol was approved by the research and ethics committee of the St. Antonius Hospital Nieuwegein and informed consent was obtained.

### **Data collection and analysis**

An interpretive methodology was chosen that emphasized the participant's perspective [21]. Semi-structured interviews collected detailed information on the participants' views and behavior. Constant comparison within and between interviews was used to analyze the data. The interviews were carefully coded to preserve the meaning of participants.

The interviews that lasted between 1 and 1.5 hours were tape-recorded and fully transcribed. Interviewees were encouraged to speak freely about themes such as the origin of their obesity, their motivation for and expectations before the operation, their experience with their past and current eating, the received social support, and expectations of future weight loss.

In qualitative data analysis, the data were disassembled into categories, examined for patterns and relationships and reassembled to provide an interpretation and explanation of the research questions. To realize this, three types of coding were used: open coding,

axial coding and selective coding. Data collection and data analysis were alternated in order to utilize emerging ideas from earlier interviews in later one's.

Open coding began with the first interviews. The interviews were read and categorized. The categories were labeled with relevant headings or codes [22]. Some of the categories were anticipated and clearly informed by the literature, like 'control', 'weight cycling', and 'expectations of the operation'. Others were derived from the data, such as 'vicious circle', 'setbacks', 'disappointment', 'guzzling', and 'testing the limits'.

Axial coding started after completion of additional interviews when we began to grasp the subject of study. The categories were further organized and main categories were distinguished from subcategories. For instance, the main category 'life before LAGB' included 'childhood experiences', 'comforting', 'first explanations', 'vicious circle' and 'unsuccessful dieting', and the category 'vicious circle' was constituted of the related categories 'psychological problems', 'health problems', 'overweight' and 'eating behavior'.

Selective coding took place after all interviews were conducted. A typology could be construed distinguishing participants with respect to three main categories: 'awareness of control', 'expectations of health behavior' and 'prospects'. We used quotes from the interviewees to summarize the core of a distinct type, such as 'It didn't work out' and 'I know I can do it'.

MAXqda2, a software package for qualitative data analysis [23], assisted in coding the data and retrieving text segments that were assigned a code later on. The researchers analyzed the data interdependently and compared and discussed the interpretations in order to prevent selective perception and interpretive bias [24].

## **RESULTS**

### **Being overweight as a youngster**

All interviewees had experienced problems with excess weight for twenty to forty years. Some attributed their weight gain to pregnancy or oral contraceptives. Several claimed to have been overweight since childhood. Some started dieting at a very young age.

The participants who remembered themselves as overweight children mentioned that weight problems ran in the family. While some believed that their obesity was hereditary, some felt that most family members were overweight because of similar cooking habits and diet. Several participants intended not to become like 'them' only to observe that they subsequently had.

## **Explanations for gaining weight**

Generally, study participants viewed their obesity as inseparable from their overall physical and mental health status. Ailments that decreased physical activity were seen as particularly detrimental to establishing and maintaining weight loss. Ann, who was injured in an automobile accident, shared the following:

‘I had to stay at home for eighteen months because of chronic whiplash. Instead of working full-time, I was inactive. That’s when I started eating because of my feelings. I gained 70 kilograms [...] because of emotions and physical inactivity.’

The automobile accident left her immobile and unable to work. A cycle of inactivity compounded by frustration and emotional distress contributed to the development of new health problems such as respiratory difficulties, fatigue, and back and joint pain.

Participants frequently attributed the reason for their weight gain to an emotional setback such as bereavement or divorce that was said to cause anxiety, depression and isolation. Five participants obtained help from a psychologist. It is well documented [5], and confirmed by our study participants, that being overweight can increase mental problems, social isolation, and feelings of shame. Physical activity was reduced in cases of social isolation and feelings of shame. Stressful life events and mental health problems triggered unhealthy food intake. Overeating was a common strategy for coping with difficult emotions. For Clara it began in childhood:

‘When I was young, I comforted myself by eating. That’s about it. In times of stress, I ate everything I could lay my hands on: dry cornflakes, dry muesli and when there was nothing else at home, even dry bread. Whenever I was having a rough time.’

This pattern of eating when feeling down was intensified when she entered into an unhappy marriage and had children at a young age:

‘It turned out that I had to support my husband more than he could support me. And I ate away all this misery. I hardly express myself. I cannot put it into words, but then I feel ignored and disappointed. And sad and rebellious. And I stuff my anger with food.’

Deborah became pregnant when she was a teenager. When shortly after her pregnancy, three close family members died, in order to cope she kept on eating and gained 70

kilograms. At that time she had a very low level of physical exercise because of chronic back pain. The interviewees comforted themselves with food and entered a vicious circle of excess weight and health and emotional problems. None of them experienced control over their psychological problems.

### **A history of unsuccessful dieting**

When asked why they wanted to lose weight, patients indicated that they wanted to achieve improved health, well-being, and functioning. All but one interviewee had dieted intensively. After years of ineffective dieting, the LAGB seemed to be a procedure that would physically support them to finally and definitely restrict their food intake. Although some had reservations, the expectations of LAGB were high. Their own role in eating after the operation seemed undervalued as they believed that the gastric band would curb their eating and do the dieting for them:

‘I expected that it would be easier to choose what to eat; that I would be able to choose the sandwich instead of the chocolate, cookie, crisps etc. I thought I would manage this easily and that in the next year I would lose thirty kilograms. That it would work out that way...’ (Wendy)

### **Testing the limits of the gastric band**

After the first postoperative weeks, when all interviewees quickly lost weight due to a liquid diet, patients discovered that they could eat only small amounts. Most felt hungry soon after completing a meal, solid food was problematic and, when the limits were exceeded, it could lodge in the gullet, causing pain and possible vomiting. The gastric band prevented the ability to eat excessive amounts and to eat quickly, as Clara said:

‘The gastric band prevents bingeing, eating too fast, and guzzling. It stops you going on and on with eating. You just cannot go on and on, that will not do. You will get sick and feel terrible.’

Participants often felt tempted to substitute meat, bread, vegetables, and fruit for sweets and tastier snacks that passed the gastric band more easily, especially when they experienced distress, loneliness or failure. Binge eating, a break-down in the control of eating, is an important feature of the people with morbid obesity [25-27]. More than half of the participants indulged in periods of overeating. None of them abandoned ‘unhealthy’

food altogether. Eating was part of a complex behavior pattern that reflected a lack of synchronicity between the intention to eat moderately and the transformation of this intention into action, as Francis explained:

‘The scales show weight gain. On the one hand I don’t care, but on the other hand I think ‘damn’. This often happens on a Thursday, and at that moment I plan to start again on Monday. In this way I allow myself to eat through the weekend. On Thursdays I start eating extra huge portions. And when Monday comes, I think now I’m going to try and do my very best. But I start out wrongly’.

All interviewees were disappointed with the outcome of the gastric band. For three the only consolation was that it could have been worse. Three others anticipated gastric bypass surgery. Disappointment stemmed from the belief that too much food could pass the band, as Simon expressed:

‘The gastric band should have been made tighter right away. A friend of mine had this operation and his band was tighter. He is just unable to eat much. I have seen him puking. He weighed one hundred and forty kilograms and lost about forty kilograms.’

When the band stretched, larger portions of food could pass the gastric band. Instead of asking the surgeon to tighten the band, the limit of the band was tested by trying what, how much, how often and how fast they could eat. Three participants failed to realize that the gastric band could help them, but eight became aware of the influence of the band on their eating behavior:

‘Now I have more control over how I eat meals and sweets. I think I am stronger now, and somewhat older. It is not the gastric band, because all the others talk about puking, and I do not have that. I can eat a lot, but now I have the right attitude.’  
(Clara)

After the operation, all participants engaged in some form of exercise. However, these efforts were mostly short-lived. Four persons stopped due to physical hindrances. Others stopped because they did not enjoy it and were disappointed with the results. Three stopped due to serious life events such as illness, although they resumed their efforts as soon as they could.

The participants attended hospital every few months. Support was derived from sharing experiences with fellow sufferers. Although satisfied with the medical guidance, nine considered dietary guidance insufficient. Two valued the dietician's role only after realizing that the outcome did depend on their diet:

‘Everyone knows what healthy food is, but you have to do the eating yourself. That’s why I stopped visiting the dietician. Perhaps I was stupid.’ (Francis)

To summarize, participants hoped and expected that the gastric band would do the work for them; that it would prevent them from overeating. Their own efforts, i.e. changing their eating patterns or asking for the band to be tightened, were poorly understood. The idea that the operation had not had the desired effect was disappointing.

### **Patterns of adjusting to LAGB**

Eight interviewees realized that they exercised control over their weight after the operation, whereas three did not. None of them could turn awareness into behavior, although three tried. Participant's expectations differed with respect to future weight loss and their ability to maintain health behavior.

Analysis of the interviews revealed four patterns (Table 1), which we matched with the stages of change model that describes the modification of eating behaviors as a progression through six stages with relapses: pre-contemplation, contemplation, preparation, action, maintenance, and termination [17]. The “It didn’t work out” participants had a long history of unsuccessful dieting and had become disillusioned with LAGB. Weight loss was minimal and, as soon as the band allowed them to eat ‘as usual’, they did. Their hope was focused on the gastric band's doing the work for them. They did not express awareness of self-control, but referred to external sources for weight loss, in particular medical interventions. The interviewees who had already registered for gastric bypass surgery did not expect that a change in behavior, such as dieting or exercising would have any effect (anymore). Nothing had worked. These participants may match the ‘Precontemplation’ stage of change. They are not aware of a health behavior problem and are not intending to take action to change.

The prevalent attitude of a single person was “I don’t care anymore”. She perceived the operation as a failure. She said that she now accepted her weight and was no longer preoccupied with dieting. She ate the food that her family was eating without self-imposed constraints. Her weight was more or less stable. Overall she felt well since she did not have to cope with the disappointment of unsuccessful dieting. Because she was aware of a

health behavior problem (but didn't care anymore) and was not intending to take action, she appeared stuck in the 'Precontemplation' stage of change.

The "I know I have to do it" participants had also a long history of unsuccessful dieting. The operation had raised an awareness that controlling their eating behavior was needed, although they had yet to achieve this. They were planning on changing their behavior only when the time was right. Two reported needing extra advice and encouragement before they could translate their plans into action. The outcome of this group was uncertain. These participants are in the 'Contemplation' stage of change. They are aware of the necessity to change and have an intention to take the steps that are needed to change.

**Table 1.** Patterns of adjustment in 11 patients after laparoscopic adjustable gastric banding

Criteria to distinguish patients	Patterns of adjustment			
	It didn't work out (n=3)	I don't care anymore (n=1)	I know I have to do it (n=4)	I know I can do it (n=3)
Awareness of control	no	neutral	yes	yes
Expectations of health behavior	no	no	yes	yes
- eating	no real change	no dieting	adjustment required	adjusted
- physical exercise	not appropriate	no efforts	find appropriate	appropriate
- support	unhelpful	no	worthwhile	useful
Prospects	medical intervention (i.e. gastric bypass)	acceptance of overweight	uncertain, action plans required	uncertain, positive reinforcement
Stage of Change	Precontemplation	Precontemplation	Contemplation	Action with frequent relapse to preparation

The "I know I can do it" participants had the same experiences as the third group. The operation had raised an awareness that controlling their eating behavior was needed and they had started to do this:

‘I am more aware of what I eat and how I eat. I know I have to eat quietly and chew well. (...) When one eats too fast or too carelessly, it gets stuck and one thinks ‘I have the gastric band and that is not without reason!’’. (Jane)

These participants tried to change their eating patterns and were sometimes successful until a setback obstructed the process, like Jane said:

‘When I am just eating I can use my common sense and stop, but when I am tense or stressed, yes, then I am inclined to eat my troubles away and unfortunately I can eat quite a lot with the gastric band.’

Whereas they needed their energy to cope with setbacks, their understanding of their own role remained. These participants may match the ‘Action’ stage of change. They made modifications in their lifestyle, but setbacks trigger relapse to the ‘Preparation’ stage. People are intending to take action in the immediate future and have typically taken significant action in the past year.

None of our participants matched the ‘Maintenance’ or ‘Termination’ stage of change. In the ‘Maintenance’ stage of change people are working to prevent relapse but they do not apply change processes as frequently as do people in the ‘Action’ stage. They are less tempted to relapse and increasingly confident that they can sustain their changes. Patients with successful enduring weight loss will likely match the ‘Termination’ stage of change.

## **DISCUSSION AND CONCLUSION**

### **Discussion**

Our qualitative study in a small group of patients with insufficient weight loss after surgery for morbid obesity, examined how patients explained their unsuccessful outcome. The disappointing experience of this “failure” group sharply contrasts with the positive experiences of most patients [11, 12]. Our particular focus was on the patients’ awareness of their own role in controlling food intake and on self-efficacy. We summarized the experiences of the patients in four patterns of adjustment, which match the precontemplation, contemplation and action stages of change. Some patients reverted to old eating habits as soon as the gastric band allowed them to and they had minimal realization of their own role. A single patient had resigned to her fate and had accepted her

severe obesity. Other patients were aware of their own role in the control of food intake, but they were stuck in contemplation and waited for the right moment to change their behavior. A last group of patients had adapted their behavior, but was unable to sustain it due to major setbacks. They intended to continue dieting as soon as possible.

Our group was a rather homogenous group in terms of a poor weight outcome. Based on our former quantitative study [10] and a qualitative study [11], the focus of our study was on awareness and self-efficacy. The interviewees described themes that were related to lack of self-awareness and lack of control abilities that are known to play a role in the maintenance of obesity such as restraint eating [28], emotional overeating [14, 20], binge eating [20, 27, 29], and poor styles of coping [26] and emotion regulation [30]. We did not assess binge eating according to clinical standards [31, 32], but the breakdown in the control of eating, especially in times of stress and distress was a frequent theme. A childhood history of being overweight and multiple unsuccessful dieting attempts reflected an enduring perceived lack of self control over food intake. Interviewees frequently described that lack of self-control was closely intertwined with affective problems. This suggests that education and interventions aimed at (behavioral) self-control and (cognitive) self-awareness will likely not be effective if affective problems such as overwhelming emotions and emotion regulation strategies are not also attended to.

Some hospitals provide a program to help patients deal with life as a non-obese person [33]. The obligation to participate in a preoperative program as an inclusion criterion for bariatric surgery may perhaps prevent inclusion of candidates who do not have the skills to maintain the weight reduction induced by the gastric band. However, it is also possible that the operation is necessary to be able to discover who will and who will not achieve a poor outcome. It is difficult to predict the postoperative weight outcome from preoperative psychological variables [10, 29, 34-36]. One study even concluded that the impact of bariatric surgery appears sufficiently potent to negate whatever preoperative differences might otherwise affect weight management [35]. This suggests that it is time to cease the search for surgical outcome predictors and focus instead on improving postoperative guidance of patients who do not achieve a successful outcome.

Our study offered a possibility to discover and describe the adjustment patterns in this sample, but we are –due to the small sample size and qualitative design- not able to conclude that these are the only patterns seen in these patients. Furthermore, our findings apply only to patients with a poor weight outcome after surgery. It is unlikely but possible that the observed lack of self-control in our failure group equally applies to the broad group of preoperative patients with morbid obesity of whom many achieve a successful outcome. A prospective study in patients with successful and unsuccessful outcomes is needed to examine that our observations would preoperatively have been predictive of

postoperative failure. This restriction with respect to generalizability of findings does not disconfirm the importance of our observations in the group with an unsuccessful weight outcome.

Our qualitative study was meant to inform and describe rather than statistically analyze and generalize. It is the first study that exclusively focuses on the perspective of patients who are not successful after bariatric surgery. Variables relating to awareness, self-control, and emotional setbacks turned out to be crucial. Over and above insight into these variables that have also been observed to obstruct healthy eating in preoperative patients with morbid obesity, a particularly new feature of this study is the obtained insight into the way in which patients bypass the food restriction imposed by the band. The analysis of the interviews in terms of the stages of change describes the core problems that hamper a successful outcome. It also indicates practice implications that can be used to try to help this unsuccessful group by increasing awareness of the need to self-control eating and offering assistance to turn intentions into action and to deal with stress, emotions and physical problems.

## **Conclusion**

Patients' explanations for unsuccessful weight loss after surgery for morbid obesity differ in terms of awareness of self-control, difficulty to turn awareness of the need to self-control into action, health behavior, and expectations of future weight loss. Patients sought explanations for their unsuccessful weight outcome in the complex interaction between health, psychological problems, and being overweight. Frequent reported explanations reflected a reduced awareness of self-control and lack of perseverance, especially in times of setbacks. Typical statements distinguishing patients were 'It didn't work out', 'I don't care anymore', 'I know I have to do it', and 'I know I can do it'.

## **Practice implications**

Considering that our interviewees constitute the most unsuccessful sample of LAGB patients, they might represent the worst cases in terms of resistance to eating and behavioral interventions. Moreover, in this specific failure group, physiological processes may have taken over control of eating in such a way that willpower and weight management are doomed to fail [37, 38]. It needs to be shown whether thorough postoperative psychological guidance will result in an improved outcome, but it is worth trying.

In overweight and obese adults, a behavioral weight managing intervention based on the stages of change model resulted in healthier eating, exercise, managing emotional distress, and progressing to the action and maintenance stages [39]. This specific program was tailored to the stage of change of the individual. The patients in our study are in the precontemplation, contemplation and action stages of change. Extrapolating findings of the above study to our group with an unsuccessful outcome, it is suggested that it could be useful to tailor postoperative guidance strategies to the stage of change of an individual patient.

Awareness of self-control is considered an essential prerequisite for behavioral change. We suggest that for the patients in the precontemplation stage postoperative guidance should first focus on increasing awareness of self-control by progressing to the preparation and contemplation stages. Most of our patients were in the contemplation or action stages (with relapse). Interventions using elements such as prior planning, rehearsal and relapse prevention can enhance individual control and maintenance of action [40, 41]. In case of type 2 diabetes, a program was developed to increase patients' proactive skills, goal attainment and confidence in dealing with self-management issues [42]. These types of interventions might be tried also for obese patients after gastric banding who have the proper awareness, but need encouragement to continue what they have started and to turn their intentions into action. Finally, all patients from the failure group including the groups who did recognize their own role, might achieve a better outcome with cognitive-behavioral guidance aimed at dealing with stress, emotions and physical problems to prevent relapse.

### **Statement of authors**

We confirm that all patient identifiers have been removed or disguised so that patients described are not identifiable and cannot be identified through the details of the stories.

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## **Chapter3**

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### **Emotion processing and regulation in women with morbid obesity who apply for bariatric surgery**

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## ABSTRACT

Emotional eating, the tendency to eat when experiencing negative affect, is prevalent in morbid obesity and may indicate that ways to deal with emotions are disturbed. Our aim was to compare emotion processing and regulation between 102 women with morbid obesity who apply for bariatric surgery and 102 women from the general population (control group) and to examine in the group with morbid obesity the association of emotion processing and regulation with emotional eating. The group with morbid obesity reported higher scores on difficulty identifying feelings (alexithymia,  $p = .002$ ) and suppression of emotions ( $p = .003$ ) than the control group. In the women with morbid obesity, more negative affect and a higher difficulty identifying feelings were correlated with more emotional eating ( $r = .36$  and  $r = .35$ ,  $p < .001$ ). Our study suggests that negative emotions and unhealthy emotion processing may play a role in emotional eating, and it indicates the possible relevance of emotion processing and emotional regulation as initiating or perpetuating mechanisms in morbid obesity.

## INTRODUCTION

Morbid obesity, a body mass index (BMI) over 40 kg/m<sup>2</sup>, is a life-threatening condition with prevalent co-morbidity (Lean, 2000) and a severely reduced quality of life (J. K. Larsen et al., 2003; Ogden, Clementi, & Aylwin, 2006). A higher body weight, particularly morbid obesity, has been associated with emotional eating, the tendency to eat when experiencing negative affect (Elfhag & Linné, 2005; Fischer et al., 2007). Emotional eating may indicate that general ways to process and regulate emotions are disturbed, which has been indicated in some studies (Fassino, Daga, Pierò, & Delsedime, 2007; Fischer et al., 2007; Heatherton & Baumeister, 1991; Van Strien & Ouwens, 2007).

The current study differentiates between processing and regulating emotions. Emotion processing refers to rather stable, automated actions that determine the type and strength of emotional experiences. Emotion regulation includes mostly intentional action plans to deal with resulting (Gross, 1998; Gross, Richards, & John, 2006). Emotion processing and emotion regulation can be assessed by means of observations and experimental tasks (Bagby, Taylor, Parker, & Dickens, 2006; Hamilton, Zautra, & Reich, 2005; Luminet, Rime, Bagby, & Taylor, 2004; Taylor & Bagby, 2004) as well as by self-report questionnaires (Bagby, Parker, & Taylor, 1994; Bagby et al., 2006; Gross & John, 1998; R. J. Larsen & Diener, 1987). The current study employs questionnaires to assess the rather stable aspects of emotion processing and emotion regulation.

Two major trait-like emotion processing styles are affect intensity and alexithymia. Individuals with high affect intensity experience their emotions strongly and are emotionally reactive and variable (R. J. Larsen & Diener, 1987). Alexithymia encompasses a number of deficits in emotion processing of which difficulty identifying and describing feelings are the main components (Taylor, 2000). Three important emotion regulation strategies are cognitive reappraisal, expression of emotions, and suppression of emotions. Cognitive reappraisal means reframing the way a situation is interpreted so as to decrease its emotional impact (Gross, 2002). Expression of emotions means sharing inner feelings with others (Pennebaker, 1990). Suppression of emotions consists of inhibiting the outward signs of inner feelings (Gross, 2002).

High affect intensity, alexithymia, and suppression of emotions are considered risk factors for emotional maladjustment (De Chouly De Lenclave, Florequin, & Bailly, 2001; Flett, Blankstein, & Obertynski, 1996; Gross & John, 2003; Moore, Zoellner, & Mollenholt, 2008). In contrast, cognitive reappraisal and expression of emotions are commonly found to be helpful for psychological health (Katz & Campbell, 1994; King & Emmons, 1990; Moore et al., 2008; Nezlek & Kuppens, 2008; Noller, 1984). Higher affect intensity has been associated with increased food intake and binge eating, i.e., episodes of

uncontrollable overeating (Chervinko, 2005; Macht, 2005). Alexithymia is prevalent in obesity, especially in obese people with psychopathology (De Chouly De Lenclave et al., 2001; Fukunishi & Kaji, 1997; Morosin & Riva, 1997; Surcinelli et al., 2007); it is associated with emotional eating in binge eating disorder, which is prevalent in morbid obesity (De Chouly De Lenclave et al., 2001; Pinaquy, Chabrol, Simon, Louvet, & Barbe, 2003). Also suppression of negative emotions has been associated with overeating, serving to (temporarily) repair negative mood (Dingemans, Martijn, Jansen, & Van Furth, 2009).

Previous studies on obesity predominantly focused on unhealthy processing and regulation of emotions (affect intensity, alexithymia, suppression of emotions). It is important to know whether healthy regulation of emotions (cognitive reappraisal, expression of emotions) is also disturbed, because this might indicate prevention and intervention possibilities for obesity. The aim of our study was to examine whether both unhealthy and healthy processing and regulation of emotions differs for people with morbid obesity as compared to people from the general population. To clarify the potential significance of emotion processing and regulation for health, in the sample with morbid obesity, the association with emotional eating was investigated. We hypothesized that women with morbid obesity have lower scores on cognitive reappraisal and expression of emotions (healthy regulation), and higher scores on affect intensity, difficulty identifying and describing feelings, and suppression of emotions (unhealthy processing and regulation) than women of the control group. Also, we hypothesize that in the group with morbid obesity, the unhealthy processing and regulation of emotions is associated with emotional eating. Besides emotional eating, two other patterns of eating behavior have been distinguished: external eating, eating in response to external food cues such as sight and smell of food, and restrained eating, cognitively controlling the urge to eat (Ouwens, Van Strien, & Van Leeuwe, 2009; Van Strien, Frijters, Bergers, & Defares, 1986). We will examine whether emotion processing and regulation are specifically associated with emotional eating but not with external and restrained eating.

## **MATERIALS AND METHODS**

### **Participants and Procedure**

Participants were female patients with morbid obesity who were screened for a bariatric operation (weight loss surgery) at the St. Antonius Hospital Nieuwegein, The Netherlands, and a female sample from the general population.

*Preoperative female patients with morbid obesity.* Consecutive patients who were admitted to a bariatric operation at the St. Antonius Hospital Nieuwegein were invited to participate in this study. The operation was performed according to previously described techniques (Belachew, Legrand, Defechereux, Burtheret, & Jacquet, 1994). Patients had been screened by a bariatric surgeon, an endocrinologist, a psychologist, and a dietician for eligibility for surgery. The surgical indications were a BMI  $\geq$  40 or a BMI between 35 and 40 with serious co-morbidity.

Written information on the study, an informed consent form, and a questionnaire booklet were sent to 248 female patients. A total of 102 patients (response rate 41%), from whom 31 were found eligible for gastric banding surgery and 71 for gastric bypass, filled out the questionnaires and returned the signed informed consent form.

The mean age of the participants was 46 (standard deviation [*SD*] = 10, range 21–68) years. The highest level of education attained by the participants was for 5 women (5%) unknown, for 30 women (30%) primary education, for 58 women (56%) secondary education, and for 9 women (9%) tertiary education. Preoperative gastric banding and gastric bypass patients did not differ in age ( $t = -0.79, p = .43$ ) and education level ( $U = 953, p = .32$ ). The BMI of the preoperative gastric banding patients (BMI =  $43.8 \pm 3.7$  kg/m<sup>2</sup>, range 37-54) was lower than the BMI of the preoperative gastric bypass patients (BMI =  $49.3 \pm 7.4$  kg/m<sup>2</sup>, range 35-71;  $t = -3.87, p < .001$ ).

*Female control group.* The female control group was selected from a sample of 196 women from the general Dutch population, who served as a control group in a former study (Van Middendorp et al., 2008). This cross-sample of women was recruited outside the health care setting. Participants were allowed to have whatever health problems that might occur in a representative community sample and had to be comparable to the patient sample with regard to region of country and socioeconomic circumstances. To this aim, the researchers strategically contacted various associations (e.g., of housewives), as well as work-related settings such as supermarkets, restaurants, and nursing homes, and recruited both staff and clients. Participants were matched to the group with morbid obesity on age and education level. The mean age of the 102 matched control participants was 45 (*SD* = 11, range 23-68) years. The highest level of education attained by the control group was unknown for 4 women (4%), primary for 23 women (23%), secondary for 65 women (63%), and tertiary for 10 women (10%). The preoperative patients with morbid obesity and the control group did not differ with respect to age ( $t = 0.18, p = .86$ ) and education level ( $U = 4718, p = .29$ ).

## Instruments

Demographic variables measured were age and education level. The questionnaire booklet included six commonly-used well-validated questionnaires. For the preoperative patients with morbid obesity, a questionnaire on eating behavior was added and their weight and height was assessed at the hospital to calculate the body mass index.

### Emotions

*Positive and negative emotions.* To measure the experience of emotions during the past month, the *Positive and Negative Affect Schedule* (PANAS) was used (Watson, Clark, & Tellegen, 1988). The PANAS consists of broad dimensions of negative affect (10 items; e.g., 'guilty', 'sad', 'angry') and positive affect (10 items: e.g., 'proud', 'energetic', 'happy'). Participants answered on a 5-point Likert scale ranging from 1 (hardly or not at all) to 5 (extremely). In this study, Cronbach's  $\alpha$  was .80 for patients and .77 for controls for positive affect, and .88 for patients and .67 for controls for negative affect.

### Emotion processing styles

*Affect intensity.* The impulse strength scale of the *Berkeley Expressivity Questionnaire* (BEQ) was used to measure affect intensity (Gross, 2000). An example item is 'I am sometimes unable to hide my feelings, even though I would like to'. The six items of the BEQ were rated from 1 (strongly disagree) to 7 (strongly agree). In this study, Cronbach's  $\alpha$  was .72 for patients and for controls.

*Alexithymia.* The *Toronto Alexithymia Scale 20* (TAS-20) (Bagby et al., 1994) was used to measure two aspects of alexithymia: difficulty identifying feelings and difficulty describing feelings. An example item of difficulty identifying feelings (7 items) is 'I have feelings that I cannot quite identify'. An example of difficulty describing feelings (5 items) is 'It is difficult for me to find the right words for my feelings'. The participants answered on a 5-point Likert rating format from 1 (strongly disagree) to 5 (strongly agree). In this study, the Cronbach's  $\alpha$  for patients and controls, respectively, was .88 and .77 for difficulty identifying feelings and .82 and .79 for difficulty describing feelings. We assessed the difficulty identifying and describing feelings scales of the TAS-20, because these scales have shown relevant for affect and because the internal consistency of the externally oriented thinking scale has been shown to be very low (Gross et al., 2006; Haviland & Reise, 1996; Kooiman, Spinhoven, & Trijsburg, 2002).

## **Emotion regulation strategies**

*Cognitive reappraisal.* The six-item cognitive reappraisal scale of the *Emotion Regulation Questionnaire* (ERQ) (Gross & John, 2003) was used. It measures the ability to achieve or maintain a positive mood (e.g., ‘When I want to feel less negative emotion I change what I’m thinking about’). The items were rated on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). In this study, the Cronbach’s  $\alpha$  was .84 for patients and .75 for controls.

*Expression of positive and negative emotions.* Two scales of the BEQ (Gross, 2000) were used to measure expression of positive (4 items) and negative (6 items) emotions. Items include ‘Whenever I feel negative emotions, people can easily see exactly what I am feeling’ (negative expressivity) and ‘I laugh out loud when someone tells me a joke that I think is funny’ (positive expressivity). The items were rated from 1 (strongly disagree) to 7 (strongly agree). In this study, the Cronbach’s  $\alpha$  for patients and controls, respectively, was .65 and .54 for expression of positive emotions, and .53 and .44 for expression of negative emotions.

*Emotional suppression.* To measure emotional suppression, the four-item expressive suppression scale of the ERQ (Gross & John, 2003) was used. An example item is ‘I control my emotions by not expressing them’. Items were rated on a 7-point scale from 1 (strongly disagree) to 7 (strongly agree). In this study, the Cronbach’s  $\alpha$  was .72 for patients and .79 for controls.

## **Eating behavior**

The Dutch Eating Behavior Questionnaire (DEBQ) was used to assess three eating behavior domains: emotional, external and restrained eating (Van Strien, 1986; Van Strien et al., 1986) Of the 33 items, 13 assess emotional eating (e.g., ‘do you have a desire to eat when you are irritated?’), 10 assess external eating (e.g., ‘If you see or smell something delicious, do you have a desire to eat it?’), and 10 items assess restrained eating (e.g., ‘do you try to eat less at mealtimes, than you would like to eat?’). The questionnaire has a five point Likert rating format, ranging from 1 (never) to 5 (very often), and the possibility to indicate that an item is not applicable for the person (e.g., ‘I am never irritated’). In this study Cronbach’s  $\alpha$ ’s were .95 for emotional eating, .86 for external eating, and .88 for restrained eating. The DEBQ was filled out by the women with morbid obesity only.

## Statistical Analyses

The SPSS Descriptives procedure was used to check data for deviations from normal distributions. The maximum skewness of the score distributions of continuous variables was 1.2, warranting parametric statistics for all variables (Tabachnick & Fidell, 2001).

Analysis of variance was used to examine differences in emotions, emotion processing styles, and emotion regulation strategies between the patients with morbid obesity and the control group, while adjusting the difference for effects of age and education. To examine the magnitude of group differences, effect sizes were computed: the difference between the means divided by the pooled standard deviation. Effect sizes of 0.2, 0.5, and 0.8 are considered to reflect differences of small, medium, and large magnitude, respectively (Cohen, 1988). Partial correlation coefficients were calculated to determine whether emotions, emotion processing styles, and emotion regulation strategies were related to emotional eating, external eating, and restrained eating in patients with morbid obesity, while adjusting the correlation for effects of age, education level, and BMI, and in secondary analysis for the other eating behaviors.

Because the group with morbid obesity and the control group were compared on seven emotion processing and emotion regulation variables, we applied the Bonferroni criterion for multiple testing leading to a conservative alpha-level of .007 (i.e., the  $p$ -value of .05 was divided by the number of 7 tests). A sample size of 102 for each group was needed to be able to detect a moderate effect size ( $d = 0.50$ ) with an independent samples  $t$ -test (2-sided test,  $\alpha = .007$ ,  $1-\beta = .80$ ) (Faul, Erdfelder, Lang, & Buchner, 2007). Therefore, we collected data until the sample size of the group with morbid obesity was 102. In discussion of the results, we will focus on the results with a  $p$ -value  $< .007$ ; thus results that meet the conservative Bonferroni criterion of multiple testing.

All analyses were done with SPSS 16.0.

## RESULTS

The mean scores of the patients with morbid obesity on the eating behavior domains were: emotional eating 2.77 ( $SD = 0.74$ ), external eating 2.80 ( $SD = 0.68$ ), and restrained eating 3.08 ( $SD = 0.62$ ). Table 1 shows the mean scores, the effect size (Cohen's  $d$ ) and significance of the difference of the patients with morbid obesity and the control group on emotions, emotion processing styles, and emotion regulation strategies.

Regarding emotions, as compared to the control group, the patients with morbid obesity experienced less positive affect ( $F = 11.65$ ,  $p = .001$ , medium effect) and more

negative affect ( $F = 42.56, p < .001$ , large effect). With respect to emotion processing styles, the patients with morbid obesity reported higher scores on difficulty identifying feelings ( $F = 10.08, p = .002$ , small effect), but did not differ from the control group with respect to difficulty describing feelings ( $F = 172, p = .19$ ) and affect intensity ( $F = 0.07, p = .79$ ). Regarding emotion regulation strategies, the patients with morbid obesity reported higher scores on suppression of emotions ( $F = 9.09, p = .003$ , small effect) than the control group, but according to the Bonferroni criterion did not significantly differ with respect to expression of negative emotions ( $F = 5.89, p = .02$ , small effect), nor with respect to cognitive reappraisal ( $F = 2.57, p = .11$ ) or expression of positive emotions ( $F = 1.67, p = .20$ ).

Emotions and emotion processing and regulation of the gastric banding and gastric bypass patients were compared. There were no differences between the two preoperative groups with morbid obesity (all  $p$ -values  $> .05$ ). Therefore, associations with eating behavior were calculated for the total group with morbid obesity.

In the patients with morbid obesity, emotion processing, emotion regulation, and eating behavior were not significantly correlated with BMI ( $p > .39$ ), but negative affect was correlated with a lower age ( $r = -.21; p = .04$ ), and three variables were correlated with a lower education level: difficulty identifying feelings ( $r = -.21, p = .04$ ), difficulty describing feelings ( $r = -.29, p = .003$ ), and suppression of emotions ( $r = -.34, p < .001$ ).

**Table 1.** Emotions, emotion processing, and emotion regulation of female patients with morbid obesity (n = 102) and a matched control group (n = 102)

	Morbid obesity <i>M (SD)</i>	Control <i>M (SD)</i>	<i>d</i>	<i>p</i>
Emotions (PANAS)				
Positive affect	3.18 (0.67)	3.49 (0.53)	0.52	*
Negative affect	2.31 (0.82)	1.70 (0.55)	0.89	*
Emotion processing				
Affect intensity (BEQ)	4.90 (1.07)	4.86 (1.06)	0.04	
Alexithymia (TAS-20)				
Difficulty identifying feelings	15.26 (6.11)	12.61 (5.78)	0.45	*
Difficulty describing feelings	12.55 (4.41)	11.67 (4.32)	0.20	
Emotion regulation				
Cognitive reappraisal (ERQ)	4.65 (1.09)	4.39 (1.12)	0.24	
Expression of emotions (BEQ)				
Expression negative emotions	3.82 (0.97)	4.16 (0.86)	0.36	
Expression positive emotions	5.33 (0.97)	5.53 (0.84)	0.22	
Suppression of emotions (ERQ)	3.57 (1.19)	2.99 (1.35)	0.46	*

Notes: In analyses of variance the means were adjusted for age and education level.

$d$  and  $p$  = the effect size (Cohen's  $d$ ) and significance of the difference between the morbid obesity and control groups. \*  $p < .007$

PANAS = Positive and Negative Affect Schedule, BEQ = Berkeley Expressivity Questionnaire, TAS-20 = Toronto Alexithymia Scale 20, ERQ = Emotion Regulation Questionnaire

**Table 2.** Partial correlations of emotions, emotion processing, and emotion regulation with emotional, external, and restrained eating (DEBQ) in patients with morbid obesity

	Emotional eating <i>r</i>	External eating <i>r</i>	Restrained eating <i>r</i>
Emotions (PANAS)			
Positive affect	-.04	-.10	.11
Negative affect	.36 *	.29 *	-.12
Emotion processing			
Affect intensity (BEQ)	.26	.11	-.01
Alexithymia (TAS-20)			
Difficulty identifying feelings	.35 *	.33 *	-.10
Difficulty describing feelings	.18	.23	-.16
Emotion regulation			
Cognitive reappraisal (ERQ)	-.07	-.14	.22
Expression of emotions (BEQ)			
Expression of negative emotions	-.05	.05	.04
Expression of positive emotions	.02	.16	-.01
Suppression of emotions (ERQ)	.07	.01	-.05

Note: Correlations were adjusted for age, education level, and body mass index.

DEBQ = Dutch Eating and Behavior Questionnaire, PANAS = Positive and Negative Affect Schedule, BEQ = Berkeley Expressivity Questionnaire, TAS-20 = Toronto Alexithymia Scale 20, ERQ = Emotion Regulation Questionnaire

\*  $p < .007$

Table 2 shows the partial correlations, adjusted for age, education level, and BMI of emotions, emotion processing, and emotion regulation with emotional, external and restrained eating in the patients with morbid obesity.

With respect to the emotions, more negative affect was significantly associated with more emotional eating and more external eating (both  $p < .001$ ). When correlations were adjusted for the other eating behaviors, the correlation between negative affect and emotional eating reduced to  $r = .23$  ( $p = .02$ ) and the correlation between negative affect and external eating reduced to  $r = .07$  ( $p = .50$ ). Regarding the emotion processing styles, more difficulty identifying feelings was significantly associated with more emotional eating and more external eating (both  $p < .001$ ). These correlations became non-significant after correction for the other eating behaviors:  $r = .19$  ( $p = .06$ ) for the correlation between difficulty identifying feelings and emotional eating and  $r = .14$  ( $p = .19$ ) for the correlation between difficulty identifying feelings and external eating. The correlations between affect intensity and emotional eating ( $r = .26$ ,  $p = .009$ ), and difficulty describing feelings and external eating ( $r = .22$ ;  $p = .03$ ) were not significant after application of the Bonferroni criterion.

Emotion regulation strategies were not significantly associated with emotional eating, external eating, or restrained eating. The correlation between cognitive reappraisal and restrained eating ( $r = .22$ ;  $p = .03$ ) was not significant after application of the Bonferroni criterion.

## DISCUSSION

Our study examined emotion processing and regulation in female patients with morbid obesity who were eligible for surgery. Besides worse affect, the women with morbid obesity had more difficulty identifying feelings and regulated their emotions more by emotional suppression than women from the general population. Thus, both less healthy emotion processing and more unhealthy emotion regulation were present in the group with morbid obesity. Especially unhealthy emotion processing was associated with more emotional eating.

The women with morbid obesity experienced more negative and less positive affect than women from the general population and more severe negative affect was associated with emotional eating and external eating. This is in agreement with previous studies (Abilés et al., 2010; Jansen et al., 2008; Poghosyan et al., 2007). Emotions are tightly intertwined with emotion processing and regulation, as emotion processing and regulation are dependent on the occurrence of emotions and emotions are dependent on emotion processing and regulation. The finding of high negative and low positive emotions confirms that it is vital to examine emotion processing and emotion regulation in this group.

We found high scores on difficulty identifying feelings in women with morbid obesity, which has also been found in addiction (Lumley, 2004). People who cannot differentiate emotions frequently experience bodily arousal that cannot be explained, leading to a general negative affective state and insufficient clues on how to regulate emotions (Van Middendorp et al., 2008). This may prompt unhealthy behaviors to modulate aversive arousal, such as drug and alcohol use, or eating (Lumley, Neely, & Burger, 2007). In support of this idea and in accordance with a previous study (Fischer et al., 2007), difficulty identifying feelings was correlated with emotional eating. This suggests that difficulty identifying feelings is a potentially relevant mechanism in the etiology or maintenance of obesity. Theoretically, emotional eating could be a mechanism that is especially used by patients with high affect intensity to dampen their intensely experienced emotions. Indeed, in other samples of patients with morbid obesity, an association between affect intensity and emotional eating was observed (Fukunishi & Kaji,

1997; Surcinelli et al., 2007). We also observed a correlation between emotional eating and affect intensity, but the small correlation was not significant according to our stringent criterion. Our cross-sectional study that does not rule out other causal pathways, tentatively suggests that the emotion processing style alexithymia is a risk factor for emotional eating.

Although from findings in studies in the general population it could be argued that high scores on the three types of eating behavior could all be related to negative affect (Jansen et al., 2008; Spoor, Bekker, Van Strien, & Van Heck, 2007; Wallis & Hetherington, 2009), the highest association was –by definition– expected between emotional eating and negative affect. Moreover, we expected that especially in patients who tend to eat in response to emotions, the ways to process and regulate emotions would be disturbed. However, our study showed that in our group of patients with morbid obesity, also external eating was associated with negative affect and difficulty identifying feelings. In a previous study in a weight-concerned, predominantly overweight female sample from the general population, no link between difficulty identifying feelings and external eating was observed (Ouwens et al., 2009), which may imply that the link between difficulty identifying feelings and external eating is specific to the group with morbid obesity. The correlations that were not strong and not longer significant after adjustment for the other eating behaviors give a weak indication that women with morbid obesity who have difficulty distinguishing between emotions not only tend to eat more in response to negative emotions, but also in response to external cues.

With respect to emotion regulation strategies, the female patients with morbid obesity reported high suppression of emotions, but this variable was not associated with eating behavior. Therefore, our study does not support the contention that education and interventions aimed at suppression of emotions could improve eating behavior in women with morbid obesity.

Psychological treatment that targets difficulty identifying feelings may be useful in this group. In patients with high affect intensity, emotional distress may be reduced by stimulating the processing and expression of negative as well as positive emotions (Ehrenreich, Fairholme, Buzzella, Ellard, & Barlow, 2007) by using emotional disclosure writing therapy (Graf, Gaudiano, & Geller, 2008; Pennebaker & Beall, 1986) or perhaps by mindfulness-based psychotherapy (Lillis, Hayes, Bunting, & Masuda, 2009). However, these approaches may lead to confusion and more emotional arousal in patients with difficulty identifying feelings (Finset, Graugaard, & Holgersen, 2006; Geenen & Van Middendorp, 2006; Lumley, 2004). Cognitive-behaviorally oriented approaches may be useful, as well as education in recognition, labeling, and adequately regulating emotions (Lumley, 2004). In patients characterized by external eating also cue exposure therapy, which focuses on breaking the learned physical reflex to eat, could be helpful (Jansen,

Broekmate, & Heymans, 1992). The effects of these therapies should be examined. The current study only points out that it might be useful to target deficient emotion processing.

Our study is the first to quantify disturbances in emotion processing and emotion regulation in women with morbid obesity. A limitation of the study is that the results cannot be generalized to men, who differ in emotion processing and regulation from women (Van Middendorp et al., 2005), to patients with morbid obesity who do not apply for surgery, or to overweight groups other than the group with morbid obesity. Emotion processing, emotion regulation, and eating behavior were measured by self-report. This assessment of the conscious trait-like aspects of these variables will only to a certain extent be similar to observational measures in daily life or measures in controlled laboratory studies. The relatively low internal consistency of the used assessments of expression of positive and negative emotions hampers the reliability of analyses with these scales. The cross-sectional research design prevents the analyses of causal relationships of negative affect with emotion processing and regulation. Future prospective research should examine whether bariatric surgery positively influences emotion processing and regulation, and whether our findings can be generalized beyond the group of women with morbid obesity who applies for surgery.

In conclusion, female patients with morbid obesity show worse affect, more difficulty identifying feelings, and more suppression of emotions than women from the general population. Our study suggests that unhealthy emotion processing may play a role in disturbed eating behavior and it indicates the possible relevance of emotion processing and emotion regulation as initiating or perpetuating mechanisms in morbid obesity.

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## **Chapter 4**

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### **The association between weight loss and self-regulation cognitions before and after laparoscopic adjustable gastric banding for obesity: a longitudinal study**

Zijlstra, H., Larsen, J.K., Van Ramshorst, B., & Geenen, R. The association between weight loss and self-regulation cognitions before and after laparoscopic adjustable banding for obesity: A longitudinal study. *Surgery* 2006; 139: 334-9.

## ABSTRACT

**Background.** The outcome of restrictive types of bariatric surgery might be affected by cognitions (beliefs) about one's capability to regulate eating behavior. Our aim was to examine the association between weight loss and self-regulation cognitions before and after laparoscopic adjustable gastric banding (LAGB) for morbid obesity or severe obesity with serious co-morbidity.

**Methods.** Six months before and 1 year after the operation, the 'Obesity Cognition Questionnaire' and an eating behavior self-efficacy scale were filled out by 77 patients: 68 female, 9 male, mean age 43 years (range 27-62), mean preoperative body mass index (BMI) 47 kg/m<sup>2</sup> (range 36-63). Pearson correlations were calculated and *t*-tests and effect size calculations were used to examine pre- to postoperative changes of self-regulation cognitions.

**Results.** The mean BMI 1 year after the operation was 38 kg/m<sup>2</sup> (range 25-55). Self-regulation cognitions did not predict weight outcome, but the self-regulation cognitions time-line (i.e. the attitude about the prognosis of one's overweight,  $p < .001$ ), psychological consequences ( $p = .002$ ) and self-efficacy ( $p < .001$ ) changed in a positive way 1 year after the operation.

**Conclusions.** Intake screening of self-regulation cognitions is of little use for prediction of short-term weight outcome after bariatric surgery. It is suggested that beliefs about one's capability to control eating behavior change after the operation.

## ABBREVIATIONS

BMI : Body Mass Index

IPQ : Illness Perception Questionnaire

LAGB: Laparoscopic Adjustable Gastric Banding

OCQ : Obesity Cognition Questionnaire

OPSQ : Obesity Psychosocial State Questionnaire

## INTRODUCTION

Obesity is a prevalent health problem.<sup>1</sup> Morbid obesity, defined as a body mass index (BMI) over 40 kg/m<sup>2</sup>, is a life-threatening condition with prevalent co-morbidity,<sup>2</sup> and severely reduced quality of life.<sup>3</sup> Although surgery is considered the treatment of choice for morbid obesity,<sup>4</sup> not all patients achieve a successful weight outcome.<sup>5-7</sup> The outcome of a restrictive type of operation such as gastric banding will depend on the degree to which the patient succeeds in adopting healthy and enduring dietary changes.<sup>8,9</sup> Behavioral actions needed to manage health threats depend on self-regulation cognitions: the beliefs about one's capability to regulate health behavior and the course of an illness.<sup>10</sup> We hypothesize that self-regulation cognitions will predict the outcome of bariatric surgery.

The self-regulation model of Leventhal and colleagues<sup>10-12</sup> distinguishes five common-sense cognitions about an illness: 1. *identity*, the label of the threat (obesity) and its symptoms; 2. *time-line*, the prognosis and changeability of the condition; 3. *cause*, the putative cause, such as stress, genes, and overeating; 4. *consequences*, the effects such as sudden death or loss of desirable activities; and 5. *cure-control*, the degree to which obesity could be prevented, cured, and kept from progressing. Another important self-regulation cognition is *self-efficacy*, the judgment of one's capability to accomplish a desired effect, such as to regulate one's eating behavior.<sup>13</sup> Interventions aimed at weight loss and changing self-regulation cognitions have been associated with improvement of eating habits and weight loss of obese persons.<sup>14-17</sup>

Apart from being a predictor of the outcome of bariatric surgery, we hypothesize that successful weight loss after the operation will change obesity-related self-regulation cognitions. For a significant proportion of patients, bariatric surgery will end a long period of helpless efforts to lose weight. Positive cognitive changes after the operation may further support the weight loss. The purpose of our study was to investigate whether self-regulation cognitions are predictors of outcome after laparoscopic adjustable gastric banding (LAGB) and whether these cognitions change as a consequence of the surgical procedure.

## METHODS

### Participants and procedure

From November 2000 until September 2003, 129 patients were subjected to a LAGB procedure in the St. Antonius Hospital Nieuwegein, the Netherlands, using the Lap-Band®

system (INAMED Health, Santa Barbara, CA, USA), following screening by a team consisting of a bariatric surgeon, an internist, a psychologist, and a dietician. Surgical indications were a BMI  $\geq$  40 or a BMI between 35 and 40 with serious co-morbidity. Obesity-related psychopathology was not an exclusion criterion for bariatric surgery. The operation was performed according to the techniques as described by Belachew and coworkers.<sup>18</sup> Questionnaires on self-regulation cognitions were completely filled out by 77 patients (68 female and 9 male; age  $43 \pm 9$  years; preoperative BMI  $47 \pm 6$  kg/m<sup>2</sup>) 6 months before and 12 months after LAGB, a total response rate of 60 % (77/129). Age, gender, preoperative BMI, and postoperative BMI at 12 months showed no differences between the 77 patients that did participate in the questionnaire study and the remainder of the eligible 129 patients ( $p > .10$ ; postoperative BMI was available for 44 non-responders). The study protocol was approved by the research and ethics committee of the St. Antonius Hospital Nieuwegein. The patients had given signed informed consent before participating.

## Measures

*Obesity-related beliefs* were measured by the 'Obesity Cognition Questionnaire' (OCQ) (Larsen JK, Geenen R. Internal report. Utrecht University, The Netherlands: Department of Health Psychology; 2002) an obesity-adapted version of the 'Illness perception Questionnaire' (IPQ).<sup>12</sup> The IPQ has adequate internal consistency, test-retest reliability and discriminant validity<sup>12</sup> as well as predictive validity for the outcome of several diseases.<sup>19-23</sup> Generic statements of the IPQ such as 'my *illness* will last a long time', are made specific for a disease. The OCQ is the obesity specific version of the IPQ with statements such as 'my *obesity* will last a long time'. The psychometric characteristics of the OCQ have been established in a preliminary sample of 134 obese patients before dietary or surgical treatment for their obesity.<sup>17</sup> Principal component analysis showed that the 25 OCQ-items could best be summarized in four factors: time-line, physical cause, behavioral cause, and psychological consequences. This solution differed from the original IPQ in two ways: The factor "cure control" that is part of the IPQ was not found and the IPQ factor 'cause' was divided into the two scales 'physical cause' and 'behavioral cause' of the OCQ.

Table 1 shows example items of the OCQ scales. A higher score on the 'time-line' scale reflects the perception of a pessimistic prognosis of one's overweight.

A higher score on the scales 'physical cause' and 'behavioral cause' reflects that one considers physical and behavioral causes of the obesity important, respectively. The scale 'psychological consequences' reflects the effects of obesity on health and personal life. To examine whether the items of a scale provide a consistent reflection of individual

differences, Cronbach's  $\alpha$  was computed;  $\alpha$  varies between 0 and 1; high values reflect consistent individual differences. Preoperatively, in our sample the internal consistency varied from small ( $\alpha < 0.60$ ) to high ( $\alpha \geq 0.70$ ). Cronbach  $\alpha$ 's were .69 (time-line), .38 (physical cause), .76 (behavioral cause), and .67 (psychological consequences). Postoperatively the internal consistency was medium ( $0.60 \leq \alpha < 0.70$ ) to high ( $\alpha \geq 0.70$ ). Cronbach  $\alpha$ 's were .77 (time-line), .83 (physical cause), .89 (behavioral cause), and .66 (psychological consequences).

**Table 1.** Example items of the Obesity Cognition Questionnaire (OCQ)

Scales	Items
Time-line	My obesity will last a long time. My obesity will diminish in the long run. (reversed scoring)
Physical cause	My obesity is hereditary; it runs in my family. My obesity is of physical origin.
Behavioral cause	Diet played a major role in causing my obesity. My obesity is largely due to my own behavior.
Psychological consequences	My obesity has strongly affected the way I see myself as a person. My obesity has had major consequences on my life.

Note:

Respondents answer to what extent they agree with the proposition on a 5-point rating-format, ranging from 1 (strongly disagree) to 5 (strongly agree).

To measure *self-efficacy*, the eating behavior self-efficacy scale of the 'Obesity Psychosocial State Questionnaire' (OPSQ)<sup>3</sup> was used. The psychometric characteristics of the OPSQ, established in a preliminary sample of 287 patients before and after surgical and dietary treatment for (severe) obesity, proved to be satisfactory<sup>3</sup> and the self-efficacy scale has shown predictive validity with respect to weight loss after a dietary intervention<sup>17</sup>. This questionnaire has a 5-point rating-format, ranging from 1 (almost never) to 5 (almost always). A high score on *self-efficacy* indicates that a person feels capable to regulate his of her eating behavior. The scale includes three items; 'being able to control eating habits', 'feeling helpless about eating behaviour' (reversed scoring), and 'being able to master eating behaviour'. The internal consistency of the eating behaviour self-efficacy scale in our sample was high: Cronbach  $\alpha$ 's were .73 preoperatively and .84 postoperatively.

*Weight and height* were assessed in the St. Antonius Hospital. Height was measured without shoes and socks. Preoperative and postoperative weight were determined during routine check-ups 6 months before and 1 year after the operation using a professional balance. The body mass index (BMI) was calculated as weight in kilograms divided by the square of the height in meters ( $\text{kg}/\text{m}^2$ ).

### **Statistical analyses**

Weight change scores were adjusted for baseline weight as follows: preoperative BMI was subtracted from BMI one year after the operation, after which multiple regression analysis was used to adjust these scores for the preoperative BMI.

The skewness of all variable scales was sufficiently normal (between  $-.73$  and  $.57$ ) to allow parametric statistics. To examine differences in self-regulation cognitions 6 months before and 1 year after operation, the paired-samples *t*-test was used. To examine the magnitude of significant results, effect sizes (Cohen's  $\alpha$ ) were computed: the difference between the pre- and postoperative means divided by the pooled standard deviations. Effect sizes of 0.2, 0.5, and 0.8 can be considered to reflect effects of small, medium, and large magnitude, respectively.<sup>24</sup> To examine the relation between weight change (the residual BMI-change score) and cognitions 6 months before and 1 year after the operation, Pearson correlation coefficients were computed. All analyses were performed with SPSS 11.5.

## **RESULTS**

### **Weight loss**

Six months before the operation the mean BMI was  $47 \text{ kg}/\text{m}^2$  (standard deviation (SD) 6; range 36 to 63) and one year after the operation  $38 \text{ kg}/\text{m}^2$  (SD 7; range 25 to 55), on average a decrease of  $-10 \text{ kg}/\text{m}^2$  (SD 5; range -2 to -23). Patients demonstrated large individual differences in weight outcome. One year after the operation, 24 patients (31%) were morbid obese ( $\text{BMI} \geq 40$ ), 22 (29 %) were severely obese ( $35 \leq \text{BMI} < 40$ ), 22 (29 %) were obese ( $30 \leq \text{BMI} < 35$ ), 8 (10 %) were overweight ( $25 \leq \text{BMI} < 30$ ), and one (1%) had a normal weight ( $\text{BMI} < 25$ ).

## Self-regulation cognitions

Table 2 shows the means and standard deviations of the self-regulation cognitions at 6 months before and at 1 year after the operation, as well as the significance ( $p$ ) and magnitude ( $d$ ) of the pre- to postoperative changes of self-regulation cognitions. After the operation patients perceived their obese condition as more prone to change than before the operation (time-line:  $p < 0.01$ ). The effect size ( $d$ ) of this difference was large ( $d > 0.80$ ). Patients were postoperatively less concerned about the adverse influences of their body weight on their health and life (psychological consequences:  $p = .002$ ,  $d = .55$  reflecting a medium change) and patients felt more capable to regulate their eating behavior (self-efficacy:  $p < 0.01$ ). The magnitude of this change was large ( $d > 0.80$ ). There were no pre- to postoperative differences in patients cognitions about the physical ( $p = .42$ ,  $d = .16$ ) or behavioral ( $p = .41$ ,  $d = .08$ ) causes of their overweight.

**Table 2.** Self-regulation cognitions of 77 patients before and after the operation. Means, standard deviations (SD); significance ( $p$ ) and effect size ( $d$ ) of the change

Self-regulation cognitions	6 months before the operation		1 year after the operation		$p$	$d^{\dagger}$
	Mean*	SD	Mean*	SD		
Time-line <sup>‡</sup>	2.98	.64	2.33	.64	.000	1.02
Physical cause	2.80	.59	2.70	.62	.420	.16
Behavioral cause	3.44	.78	3.53	.73	.407	.08
Psychological Consequences	3.72	.60	3.39	.61	.002	.55
Self-efficacy	2.59	.74	3.73	.78	.000	1.50

\* Self-regulations cognitions have a range from 1 to 5.

<sup>†</sup> An effect size ( $d$ ) smaller than 0.2 reflects no change, while effect sizes of 0.2, 0.5, 0.8 are considered small, medium, and large changes, respectively.

<sup>‡</sup> A higher score at 'time-line' reflects the perception of a pessimistic prognosis

Note:

Before the operation there was 1 missing values on psychological consequences.

After the operation there were 5 missing values on time-line, physical cause, behavior cause, and psychological consequences, and 3 on self-efficacy.

## Self-regulation cognitions and weight loss

Correlations between weight loss and self-regulation cognitions six months before and one year after the operation are shown in Table 3. Self-regulation cognitions six months before the operation were not correlated with weight loss.

One year after the operation weight loss was correlated with self-efficacy ( $r = -.26$ ,  $p = .02$ ): patients who had lost more weight felt more capable to regulate their eating behavior. The self-regulation cognitions time-line, physical cause, behavioral cause, and psychological consequences were not significantly associated with residual weight loss. There was a trend to significance for the correlation between time-line and residual weight loss ( $r = .20$ ,  $p = .09$ ): patients who had lost more weight tended to perceive their obese condition as more prone to change.

**Table 3.** Correlations between weight loss (residual BMI-change) and self-regulation cognitions before and after the operation of 77 patients

Self-regulation cognitions	6 months before the operation	1 year after the operation
Time-line	-.05	.20 <sup>†</sup>
Physical cause	.18	.08
Behavioral cause	-.03	.08
Psychological Consequences	.15	-.06
Self-efficacy	-.02	-.26 <sup>*</sup>

\* $p < 0.05$  † $p < 0.10$

Note:

Before the operation there was 1 missing values on psychological consequences.

After the operation there were 5 missing values on time-line, physical cause, behavior cause, and psychological consequences, and 3 on self-efficacy.

## DISCUSSION

The self-regulation cognitions time-line, psychological consequences, and self-efficacy changed in a positive direction after the surgical procedure. Self-regulation cognitions before gastric banding did not predict weight loss after the operation. Self-efficacy beliefs

after the operation showed a small association with the weight outcome 1 year after the operation.

Because our study was not a controlled experimental trial, it is impossible to demonstrate causal relationships. Our results do, however, strongly suggest that bariatric surgery for morbid obesity changes beliefs about one's capability to regulate eating behavior. Before the operation, self-regulation cognitions of patients reflected a helpless and pessimistic state. This condition has been called 'learned helplessness'.<sup>25,26</sup> Many patients with morbid obesity will have learned that repeated efforts to lose weight failed and that the situation has become unchangeable. After the operation, three of five self-regulation cognitions changed in a positive way. Patients became less pessimistic about the changeability of their obesity, they perceived a reduced psychological impact of their obese state, and were on average more confident about their eating behavior self-efficacy. These changes in self-regulation may further support the outcome as it has been shown that optimism and a positive outcome expectancy as well as self-efficacy are related to positive health behaviors, such as exercising regularly,<sup>27, 28</sup> avoiding fatty foods,<sup>29</sup> and changing consumption of alcoholic beverages.<sup>19</sup> That ideas of patients about the physical or behavioral cause of their weight did on average not change after the operation, suggests that patients with morbid obesity who apply for bariatric surgery generally have a rather stable and perhaps realistic view that their overweight is the result of biological and behavioral influences.

We expected that self-regulation cognitions would predict weight loss after gastric banding. Self-regulation cognitions have been shown to affect the outcome of asthma,<sup>20</sup> rheumatoid arthritis,<sup>21</sup> and irritable bowel syndrome,<sup>23</sup> while eating-behavior self-efficacy predicted weight loss after dietary interventions.<sup>14-17</sup> However, our study demonstrated that preoperative self-regulation cognitions did not predict weight loss after gastric banding for morbid obesity. Our findings are in line with findings from other bariatric surgery studies, showing that preoperative psychiatric disturbances<sup>9</sup>, personality characteristics<sup>7,30</sup>, and preoperative binge eating<sup>31-34</sup> do not predict postoperative weight outcome. Our obese sample was different from overweight samples after dietary interventions in the sense that patients were more severely obese. Moreover, the self-regulation conditions of our patients reflected a worse state (more pessimistic, a stronger attribution to physical and behavioral causes, worse psychological consequences, and less self-efficacious) than the self-regulation cognitions of patients who applied for a dietary intervention.<sup>17</sup> The pessimistic cognitive appraisal of our patients might have had a realistic component and is likely the very reason why they applied for bariatric surgery. Whatever the exact mechanisms, our results strongly suggest that surgically induced effects of weight loss after gastric banding are achieved quite independent of preoperative self-regulation cognitions. The clinical

implication is that there appears little need to assess self-regulation as part of the intake screening or to offer help to change pre-operative self-regulation cognitions.

In agreement with previous correlational observations<sup>8,35</sup>, we found that patients who had lost more weight after the operation reported postoperatively to have acquired more self-efficacy in their ability to control eating behavior. However, overall weight outcome and self-regulation cognitions were not strongly related, suggesting that no large and perhaps no lasting changes in self-regulation cognitions have been brought about at one year after the operation when several patients were still losing weight. When more patients have stopped losing weight or even regain weight, which occurs mostly about two years postoperatively,<sup>6</sup> self-regulation cognitions may become more important to maintain health behaviors. Only research will be able to show whether weight loss maintenance after the operation might be improved by postoperative cognitive-behavioral guidance aimed at improving self-regulation cognitions.

In conclusion, our study demonstrated that self-regulation cognitions do not predict weight outcome 1 year after the operation. This suggests that assessment of self-regulation cognitions as intake screening is of little use for prediction of short-term weight outcome after bariatric surgery. Our study suggests that beliefs about one's capability to regulate eating behavior change after bariatric surgery.

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## **Chapter 5**

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### **Initiation and maintenance of weight loss after laparoscopic adjustable gastric banding. The role of outcome expectation and satisfaction with the psychosocial outcome**

Zijlstra, H., Larsen, J.K., De Ridder, D.T.D., Van Ramshorst, B., & Geenen, R. Initiation and maintenance of weight loss after laparoscopic adjustable gastric banding. The role of outcome expectancy and satisfaction with the psychosocial outcome. *Obesity Surgery* 2009; 19: 725-31.

## ABSTRACT

**Introduction.** A premise of this study was that different psychological processes will predict the initiation and maintenance of weight loss after surgery for morbid obesity. Our aim was to examine whether more favorable preoperative expectations of psychosocial outcomes predict weight loss in the first year after laparoscopic adjustable gastric banding (LAGB), and whether postoperative satisfaction with these outcomes predicts weight maintenance in the second year after the operation.

**Materials and Methods.** Six months before and one year after surgery, the ‘Obesity Psychosocial State Questionnaire’ was filled out by 91 patients (77 f, 14 m, mean age  $45 \pm 9$  years, mean preoperative body mass index  $47 \pm 6$  kg/m<sup>2</sup>). We evaluated the preoperative outcome expectations and the postoperative satisfaction for the seven domains of psychosocial and physical functioning of this questionnaire, as well as the correlations between these scores and both weight loss and weight maintenance.

**Results.** Patients showed high satisfaction with psychosocial outcomes after LAGB in all seven domains ( $p < .001$ ), even though the improvement was less than expected in five of the domains ( $p \leq .01$ ). While weight loss one year after the operation was related to satisfaction with psychosocial outcomes ( $p \leq .05$ ), preoperative expectations were not related to weight loss in the first year after surgery and satisfaction with the outcomes was not related to weight maintenance in the second year after surgery.

**Discussion.** Our study suggests that surgically-induced effects of weight loss and weight maintenance are achieved independently of the patient’s preoperative expectations of, and postoperative satisfaction with, the psychosocial outcomes.

## INTRODUCTION

Morbid obesity, defined as a body mass index (BMI) of 40 kg/m<sup>2</sup> or higher, is a life-threatening condition with prevalent co-morbidity and severely reduced quality of life [1]. Although surgery is considered to be the treatment of choice for morbid obesity [2], it is not a panacea that makes lifestyle changes superfluous. Not all patients will achieve a successful weight outcome [3-5] and a number of patients will fail to adopt healthy and enduring dietary changes following surgery [6,7].

Within the field of health psychology, it has been proposed that health behavior may depend on outcome expectations and satisfaction with the outcome. One model is based on the premise that the initiation and maintenance of behavior change involve different decision processes [8]. Positive expectations of the consequences of behavior change are thought to guide the initiation of health behavior, whereas satisfaction with the outcome guides decisions on maintenance of health behavior [9]. According to this model, initiation can be considered an ‘approach’-based, self-regulated process in which people strive to reduce the discrepancy between their current state and their desired state [8-11], whereas maintenance can be regarded as an ‘avoidance’-based, self-regulated process in which people strive to maintain the discrepancy between their favorable current state and an undesired prior state [9,10].

Especially in non-surgical weight loss interventions, higher outcome expectations are associated with increased weight loss [12-14], a finding which was not confirmed in one study evaluating a surgical intervention [15]. While a qualitative study [16] and a pilot study [4] both suggested that satisfaction is associated with weight loss maintenance, a quantitative study did not confirm these observations [17]. One aspect of expectation and satisfaction is the disparity between them, i.e. the extent of unfulfilled expectations. In general, patients tend to have unrealistic expectations with respect to the outcome of bariatric surgery [18]. In non-surgical weight loss interventions, these unrealistic expectations have been shown to be linked to higher attrition [19], lower satisfaction [12], and less healthy psychological and eating behavior characteristics [13], but not to maintenance of weight loss [12,17]. In the current study, the prognostic effects of expectations, satisfaction, and unfulfilled expectations are disentangled.

Although weight loss is an obvious outcome of surgery for morbid obesity, it is not the ultimate goal patients want to achieve [18]. Instead, weight loss is a means to achieve goals such as the improvement of physical function, mental health, physical appearance, self-efficacy regarding eating and weight control, social acceptance, intimacy, and social contacts. The purpose of our study was to examine the preoperative expectations of achieving these psychosocial outcomes and the satisfaction with these outcomes as

predictors of weight loss and weight loss maintenance following laparoscopic adjustable gastric banding (LAGB) for severe obesity. Our hypotheses were that (1) more favorable preoperative expectations with respect to psychosocial states after the operation would promote weight loss at one year after LAGB and (2) more satisfaction with the psychosocial outcomes one year after the operation would predict weight loss maintenance at two years after LAGB. Related to these hypotheses is the expectation that (3) a greater extent of ‘unfulfilled expectations’ with respect to the psychosocial outcomes could be linked to more weight loss at one year and less weight maintenance at two years after LAGB.

## **MATERIALS AND METHODS**

### **Participants and Procedure**

Between November 2000 and November 2004, 156 patients were subjected to a LAGB procedure at the St. Antonius Hospital Nieuwegein, the Netherlands, using the Lap-Band® system (INAMED Health, Santa Barbara, CA, USA), following screening by a bariatric surgeon, an endocrinologist, a psychologist and a dietician. Surgical indications were a BMI  $\geq$  40 or a BMI between 35 and 40 with serious co-morbidity. The operation was performed according to the techniques described by Belachew and co-workers [20]. The study protocol was approved by the Research and Ethics Committee of the hospital.

Of the 156 patients who underwent surgery, 134 attended a preoperative meeting during which they were asked to participate in this prospective questionnaire study. Seven patients who attended the meeting did not return a signed informed consent form, and four patients underwent surgery before the researcher had sent out the preoperative questionnaire, resulting in 123 eligible patients.

Of these patients, 113 (92%) filled out questionnaires before the operation. After surgery, two patients underwent a gastric bypass, three patients withdrew participation due to severe psychopathology and seventeen patients had incomplete weight records one or two years after the operation or did not return the questionnaire one year after the operation. There were no differences in gender, age, and mean BMIs between the 91 patients with complete records and the 32 eligible patients with incomplete records ( $p$  values  $>$  .27).

The 91 participating patients consisted of 77 women and 14 men with a mean age of 45 $\pm$ 9 years. The highest level of education attained by the patients was: primary education 7 patients, secondary education 75 patients, and tertiary education 9 patients. The mean

BMIs six months before the operation and one and two years after the operation were  $47\pm 6$ ,  $37\pm 7$ , and  $36\pm 7$  respectively.

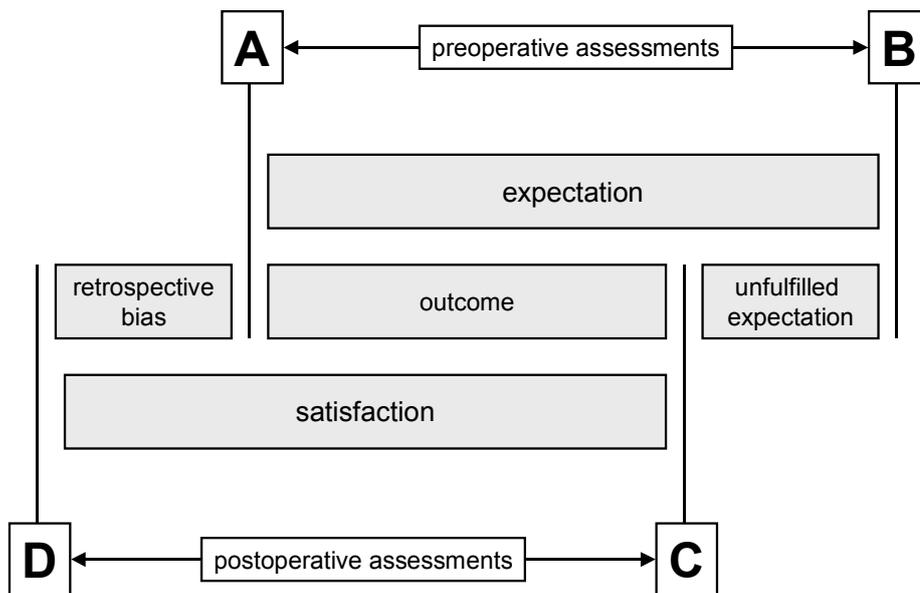
## **Instruments**

The actual, expected, and past psychosocial states were measured using the 'Obesity Psychosocial State Questionnaire' (OPSQ) [21]. The OPSQ measures seven domains: 'physical function' (fifteen items; e.g. 'to kneel or stoop easily'), 'mental well-being' (six items; e.g. 'to feel depressed'), 'physical appearance' (nine items; e.g. 'to feel fat when photographed'), 'social acceptance' (four items; e.g. 'to be singled out because of my weight'), 'self-efficacy regarding eating and weight control' (three items; e.g. 'to feel helpless about my eating behavior'), 'intimacy' (four items; e.g. 'to have sexual problems because of my weight') and 'social network' (two items; e.g. 'to visit friends and acquaintances'). The questionnaire has a five-point Likert rating format, ranging from one (almost never) to five (almost always). The psychometric characteristics of the OPSQ, established in a sample of 287 patients before and after (surgical or dietary) treatment for (severe) obesity, are satisfactory [21].

## **Procedure**

The OPSQ questionnaire was filled out by the patients six months before and one year after the operation. Six months preoperatively, patients were asked (A) to what extent the item had applied to them in the past two months and (B) how they expected the item would apply to them about one year after the operation. One year after the operation, the patients were asked (C) to what extent the item had applied to them in the past two months and (D) to what extent the item had applied to them before the operation.

Figure 1 shows the definitions of this study. The two main definitions - preoperative outcome expectation (B minus A) and postoperative satisfaction (C minus D) - are composed of three other definitions: improvement (C minus A), unfulfilled expectation (B minus C), and retrospective bias (A minus D).



**Figure 1.** Diagram showing the definitions used in this study

Six months preoperatively, the patients indicated (A) their current psychosocial state and (B) their expected psychosocial state one year after the operation. One year after the operation, the patients indicated (C) their current psychosocial state and (D) the retrospective judgment of their psychosocial state before the operation. The preoperative outcome expectation, i.e. the discrepancy between the current preoperative state and the expected postoperative state (B-A), is composed of the improvement (C-A) combined with the unfulfilled expectation (B-C). The postoperative satisfaction, i.e. the discrepancy between the current postoperative state and an undesired preoperative state (C-D), is composed of the improvement (C-A) combined with retrospective perception bias (A-D)

## Statistical Analyses

Weight loss in the first and second years after the operation was defined as the percentage of Excess Body Mass Index Lost (%EBL) according to standard procedures [22]. Weight loss maintenance in the second postoperative year was defined as the difference between %EBL at one and two years after the operation.

The Wilcoxon signed ranks test was used to compare the number of patients who obtained a negative, zero, or positive score for preoperative outcome expectations, postoperative satisfaction, and unfulfilled expectations.

The score distributions of the psychosocial state and weight loss variables were normal [23]. Pearson correlations were calculated to determine whether preoperative

outcome expectations, postoperative satisfaction, and unfulfilled expectations were related to weight loss in the first year after surgery and to weight loss maintenance in the second year after surgery.

In ancillary analyses, Pearson correlations were used to examine the relationship of the current state before the operation (A), the expected state after the operation (B), the current state after the operation (C), and the retrospective appraisal of the state before the operation (D) with weight loss in the first year and weight maintenance in the second year after the operation.

All analyses were performed with SPSS 15.0 (Chicago, Ill).

## RESULTS

The mean percentage of excess BMI loss was  $46 \pm 22$  (range 7 to 106) in the first year and  $51 \pm 26$  (range -9 to 122) in the first two years. The mean excess BMI loss in the second year minus excess weight loss in the first year was  $5 \pm 14$  (range -39 to 39).

### Analysis of Frequencies

Table 1 shows the number of patients who obtained a negative, zero, or positive score on outcome expectations, satisfaction and unfulfilled expectations. The 'social network' variable was a two-item variable with only a few possible scores, which explains the relatively large number of patients who obtained a zero score for this variable. The vast majority of patients had a positive outcome expectation before the operation and was satisfied with the psychosocial outcome after the operation ( $p < .001$  in all cases). Analyses of 'unfulfilled expectations' showed that preoperatively more patients had been too optimistic than too pessimistic about five postoperative outcomes ( $p < .01$ ). For 'mental well-being' ( $p = .12$ ) and 'social network' ( $p = .81$ ) the number of too optimistic and too pessimistic patients did not significantly differ.

**Table 1.** The number of patients (out of a total of 91) who obtained a negative (-), zero (0), or positive (+) score on preoperative outcome expectations, postoperative satisfaction, and unfulfilled expectations

<b>Psychosocial states</b>	<b>-</b>	<b>0</b>	<b>+</b>	<b><i>p</i></b>
<i>Preoperative outcome expectations (B-A)</i>				
Physical function	-	-	91	< .001
Mental well-being	1	13	77	< .001
Physical appearance	1	-	90	< .001
Social acceptance	2	7	82	< .001
Self-efficacy	1	2	88	< .001
Intimacy	1	13	77	< .001
Social network	4	38	49	< .001
<i>Postoperative satisfaction (C-D)</i>				
Physical function	6	1	84	< .001
Mental well-being	6	10	75	< .001
Physical appearance	2	3	86	< .001
Social acceptance	2	10	79	< .001
Self-efficacy	1	4	86	< .001
Intimacy	3	18	67	< .001
Social network	3	44	44	< .001
<i>Unfulfilled expectations (B-C)</i>				
Physical function	28	3	60	< .001
Mental well-being	35	13	43	.12
Physical appearance	17	4	70	< .001
Social acceptance	24	12	55	< .001
Self-efficacy	19	13	59	< .001
Intimacy	32	8	48	.004
Social network	30	28	33	.49

A positive (+) score indicates that the patient preoperatively expects a good outcome, is postoperatively satisfied with the outcome, or appraises the postoperative state as worse than expected before the operation

## Correlational Analyses

Table 2 shows the correlations of outcome expectations, satisfaction, and unfulfilled expectations for the seven psychosocial states with weight loss in the first year after the operation and with weight loss maintenance in the second year after the operation

*Preoperative Outcome Expectations.* Neither weight loss in the first year after the operation nor weight loss maintenance in the second year after the operation was significantly correlated to any of the preoperative outcome expectations for the seven psychosocial states, with only one exception. The expectation of an improved social network was correlated with a better maintenance of weight loss in the second year after the operation ( $r = .23, p = .03$ ).

**Table 2.** Correlations for 91 patients of the preoperative outcome expectations, postoperative satisfaction, and unfulfilled expectations for seven psychosocial states with weight loss one year after the operation and weight loss maintenance in the second year after the operation

Psychosocial states	Weight loss		Weight loss maintenance	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
<i>Preoperative outcome expectations (B-A)</i>				
Physical function	.01	.90	.03	.75
Mental well-being	.06	.60	.14	.18
Physical appearance	.02	.89	.14	.19
Social acceptance	-.07	.50	.07	.53
Self-efficacy	.08	.45	.07	.54
Intimacy	.07	.50	-.15	.16
Social network	.09	.41	.23	.03
<i>Postoperative satisfaction (C-D)</i>				
Physical function	.39	<.001	.01	.96
Mental well-being	.37	<.001	.07	.51
Physical appearance	.52	<.001	.01	.93
Social acceptance	.54	<.001	.01	.89
Self-efficacy	.43	<.001	.06	.60
Intimacy	.38	<.001	.04	.72
Social network	.21	.05	-.02	.89
<i>Unfulfilled expectations (B-C)</i>				
Physical function	-.31	.002	.03	.75
Mental well-being	-.27	.009	-.01	.90
Physical appearance	-.31	.003	.09	.39
Social acceptance	-.28	.007	-.06	.57
Self-efficacy	-.25	.02	.00	.97
Intimacy	-.12	.26	-.04	.69
Social network	-.24	.02	.03	.80

Weight loss in the first year after the operation was defined as the percentage of Excess Body Mass Index Lost (%EBL) [22]. Weight loss maintenance was defined as the difference between %EBL at one and two years after the operation

*Postoperative Satisfaction.* Weight loss in the first year after the operation was correlated significantly with postoperative satisfaction for all psychological states. Patients who had lost more weight felt most satisfaction. Two correlations were large ( $r > .50$ ): patients who lost more weight were more satisfied with both their ‘physical appearance’ ( $r = .52$ ;  $p < .001$ ) and ‘social acceptance’ ( $r = .54$ ;  $p < .001$ ). Weight loss maintenance in the second year after the operation was not related to the satisfaction of any of the seven psychosocial states.

*Unfulfilled Expectations.* Less weight loss in the first year after the operation was significantly correlated with higher unfulfilled expectations for six of the seven psychosocial states. Patients with less weight loss had expected to improve more on these psychosocial states than they actually did. Weight loss maintenance between the first and second years was not correlated with unfulfilled expectations for the seven psychological states.

### **Ancillary Analyses**

To further insight into the correlation between weight loss and psychosocial states, we correlated the four scores which were used to define preoperative outcome expectations, postoperative satisfaction, and unfulfilled expectations with weight loss in the first year after the operation, and with weight loss maintenance in the second year after the operation.

Weight loss in the first year after the operation was correlated with neither the psychosocial states before the operation (A; correlations varied from  $r = -.15, p = .17$  to  $r = .15, p = .16$ ), nor the postoperative psychosocial states expected after the operation (B; correlations varied from  $r = -.12, p = .24$  to  $r = .16, p = .14$ ).

More weight loss in the first year correlated with a better score on five of the seven psychological states after the operation (C): physical function  $r = .39, p < .001$ , mental well-being  $r = .25, p = .02$ , physical appearance  $r = .37, p < .001$ , social acceptance  $r = .40, p < .001$ , and self-efficacy  $r = .33, p = .001$ .

Weight loss in the first year was correlated with retrospective appraisals of one psychosocial state before the operation (D): self-efficacy  $r = -.25, p = .02$ . The patients with less weight loss reported retrospectively the most positive appraisal of self-efficacy before the operation.

None of the scores of the participants (A, B, C, or D) correlated with weight loss maintenance in the second year after the operation.

## **DISCUSSION**

Our study did not confirm the hypotheses that preoperative outcome expectations and postoperative outcome satisfaction can predict weight loss and weight loss maintenance after LAGB. Assets of this study are the prospective design, the use of an obesity-tailored quality of life instrument, and the comprehensive definition of current, predictive, and retrospective evaluations of psychosocial states.

Many theories in the field of health psychology reflect the idea that positive outcome expectations guide decisions to initiate behavior change, for example the ‘Health Belief Model’ [24], ‘Theory of Planned Behavior’ [25], ‘Stages of Change (transtheoretical) Model’ [26], and ‘Social Cognitive Theory’ [27]. These theories, as well as the observation that positive outcome expectations predict the outcome of non-surgical weight loss interventions [12-14], led to our first hypothesis that favorable preoperative expectations with respect to the psychosocial outcomes after LAGB would promote postoperative weight loss at one year. As shown in another study on bariatric surgery patients [15], the hypothesis was not confirmed. This suggests that, during the weight loss phase after bariatric surgery, the effect of the gastric banding on weight loss is more important than the supporting effect of psychological variables on the weight loss. While the idea that positive outcome expectations guide decisions to initiate behavior change appears to apply to heterogeneous groups with less severe obesity, this idea did not apply to our group in which the surgical intervention was a final solution after a long history of unsuccessful behavioral attempts to lose weight.

Our definition of outcome expectation included two components: the actual improvement and the unfulfilled expectations. The latter overlaps with definitions of ‘unrealistic optimism’, which has been considered a common, healthy, and adaptive human characteristic [28] that is thought to guide decisions to initiate behavior change [9]. In agreement with a previous study [17], the weight loss-related psychosocial benefits in our patients were smaller than expected. For six variables a greater degree of unfulfilled expectation was correlated with less weight loss. This suggests that unrealistic expectations are associated with a poor psychosocial outcome. However, this suggestion was not supported by our results. Ancillary analyses demonstrated that the degree of weight loss was correlated with the actual psychosocial state after the operation, but not with the postoperative psychosocial state that was expected preoperatively. In our group of patients with morbid obesity who applied for an operation, it proved impossible to predict weight outcome based on expectations before the surgical intervention.

In line with the psychological theory that people strive to maintain a discrepancy between their favorable current state and an undesired prior state [10,16], our second hypothesis was that increased satisfaction with the psychosocial outcome at one year would predict weight loss maintenance at two years after LAGB. We included in our definition of satisfaction the postoperative appraisal of the preoperative situation as a reflection of an undesired prior state. The retrospective perception of the preoperative situation is considered more important for current satisfaction than the actual situation before the operation. The hypothesis was not confirmed; satisfaction with the psychosocial outcome after one year did not predict weight loss maintenance in the year thereafter.

Ancillary analyses showed that five of the seven perceived psychosocial states one year after the operation were linked to weight loss during the first but not the second year. This result suggests that a favorable psychosocial outcome is a consequence of weight loss, rather than the converse situation in which psychosocial states predict weight loss or weight loss maintenance after LAGB.

The findings of our prospective study with respect to prediction of weight loss maintenance only apply to the relatively short two-year follow-up. Some patients regain weight from two years after bariatric surgery [5,29]. Our analyses do not refute the possibility that dissatisfaction with the psychosocial outcome impedes long-term weight loss maintenance. Since there were no significant differences in either demographic characteristics or weight between those who participated in our study and those who declined participation, it is unlikely that the generalizability of the findings is hampered by the patients who declined participation in the study.

In agreement with previous observations [30,31], our study suggests that it is difficult to predict the postoperative weight outcome based on preoperative psychological variables. The operation is necessary to be able to discover who will and who will not need psychological guidance to achieve a successful outcome. Our study indicates that weight loss after the operation leads to satisfaction with the achieved psychosocial outcomes. The surgically-induced effects of weight loss and short-term weight loss maintenance are achieved independently of patients' preoperative expectations and postoperative satisfaction with the psychosocial outcomes.

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## **Chapter 6**

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### **The long-term course of quality of life and the prediction of weight outcome after laparoscopic adjustable gastric banding. A prospective study**

Zijlstra, H., Larsen, J.K., Wouters, E.J.M., Van Ramshorst, B., & Geenen. R. (2011). The long-term course of quality of life and the prediction of weight outcome after laparoscopic adjustable gastric banding. A prospective study. Manuscript submitted for publication.

## ABSTRACT

**Background.** This prospective study examines physical and mental quality of life up to six years after laparoscopic adjustable gastric banding (LAGB) and the predictive role of quality of life for weight outcome.

**Methods.** 45 LAGB patients (38 female, 7 male) filled out the short form-36 (SF-36) health survey and Beck Depression Inventory (BDI) six months before and one and six years after LAGB. Body mass index (BMI) was assessed. Repeated measures analyses of variance and multiple regression analyses were used.

**Results.** Physical functioning but not mental well-being improved significantly between baseline and one year after LAGB, whereas a non-significant deterioration occurred for both quality of life dimensions between one year and six years follow-up. Mental well-being and depressive symptoms were strongly correlated. A lower mental well-being -or the presence of more depressive symptoms- before surgery and at one year after surgery predicted a larger reduction of BMI at six years.

**Conclusions.** After LAGB, physical functioning improves more clearly than mental well-being but this improvement does not continue during the five years to follow. A lower mental well-being -and related depressive symptoms- forecast a better weight outcome in the long-term. This supports models suggesting that the perceived threat or burden of a disease may act as a cue to change one's health behavior.

## INTRODUCTION

Morbid obesity, defined as a body mass index (BMI) of 40 kg/m<sup>2</sup> or higher, is a chronic disorder with prevalent co-morbidity and impaired quality of life [1]. Bariatric surgery is the only effective treatment for patients with morbid obesity [2]. Quality of life is considered an important outcome measure besides weight loss and reduced co-morbidity in bariatric surgery. Just after surgery most patients lose a great deal of weight and experience improvements in quality of life [3-9]. In many people, from two years after surgery onwards, weight stabilizes or slightly increases. With respect to quality of life, some studies suggest a decline in quality of life after two years or more after surgery [10,11], while other studies do not [8]. The conclusion in a recent review was that improvements in health-related quality of life occur up to two years after surgery, whereas effects at long-term follow-up are mixed [9].

Although quality of life is often assessed as a secondary outcome measure after bariatric surgery, it could also be considered a predictor of health behavior. It is possible that a low quality of life -like depression- obstructs health behavior, because of a shortage of will-power [12] or self-efficacy, the judgment of one's capability to accomplish a desired effect such as to regulate one's eating behavior [13]. In contrast, according to the Health belief model [14], the perceived threat of a disease and the perceived benefits versus barriers to behavioral change determine the likelihood of behavioral change. Some researchers use all of the components of this model, while others use selected parts. In the current study, we focus on 'the perceived threat' component. We propose that a low quality of life may be 'a threatening cue to action', i.e., a signal that a change of health status is needed, while a good quality of life may be a signal that no further action is needed. In line with this notion, lower levels of quality of life have been associated with treatment-seeking behavior in obesity [15]. Severely obese persons seeking surgical obesity treatment had a lower quality of life compared to other overweight and obese populations even after adjustment for weight [1], and in patients with unsuccessful weight loss after gastric banding a lower mental quality of life appeared a signal for conversion to gastric bypass [16].

There is some literature -providing mixed evidence- on the predictive value of depressive symptoms for weight outcome in bariatric surgery patients. Some studies found that depressive symptoms predicted a better weight outcome [16,17], other studies found no evidence for the predictive value of depressive symptoms [18-20], and still other studies found that depression predicted a worse weight outcome, but these studies measured depressive disorder instead of depressive symptoms [21-23]. We did not have a specific hypothesis with respect to the prospective association between depressive symptoms and

weight outcome. While depression may obstruct weight loss, the burden of depressive symptoms in the absence of depressive disorder could also be a cue for action to lose more weight.

Just after surgery most patients are in a ‘honeymoon phase’ in which they lose a lot of weight, and functioning and well-being increase a lot, which may explain the lack of predictive findings. After two years, some patients regain weight and pre-surgical quality of life may be associated with weight outcome. The aim of our study was to examine the quality of life outcome after bariatric surgery as well as the predictive role of quality of life for weight outcome. Our prospective study was particularly set up to examine predictors of both the short-term (one year) and long-term (six years) outcome after laparoscopic adjustable gastric banding (LAGB). We expected that a lower quality of life -being a ‘threatening cue to action’- would be associated with a lower BMI at long-term follow-up.

## **MATERIALS AND METHODS**

### **Participants and procedure**

Between November 2000 and November 2004, 156 patients were subjected to a LAGB procedure at the St. Antonius Hospital Nieuwegein, the Netherlands, using the Lap-Band® system (INAMED Health, Santa Barbara, CA, USA), following screening by a bariatric surgeon, an endocrinologist, a psychologist and a dietician. Surgical indications were a BMI  $\geq 40$  or a BMI  $\geq 35$  in the presence of significant co-morbidity. The operation was performed according to the techniques described by Belachew and co-workers [17]. The study protocol was approved by the Research and Ethics Committee of the hospital.

Of the 156 patients, 91 participated in a large-scale survey study including quality of life and depressive symptoms measures six months before and one year after LAGB. Information about the dropouts has been described in our former study [18]. For this study, we asked the 91 participating patients from this former study to fill out again questionnaires on quality of life. This was on average 5.9 ( $SD = 1.0$ , range 4 - 8) years postoperatively. Between four and eight years after LAGB, 15 patients underwent a gastric bypass, 2 patients died, and 29 patients had incomplete weight records or did not return the questionnaire. The remaining 45 participating patients consisted of 38 women and 7 men with a mean age of 48 ( $SD = 9$ , range 31- 64) years, 42 patients (94%) had followed secondary education (1 patient had followed primary education and 2 patients had followed tertiary education).

Attrition analyses using logistic regression revealed no differences between the 45 participating patients and the 29 patients with incomplete records with respect to age, gender, preoperative BMI, BMI one year after operation, and BMI six years after operation (all  $p$ 's  $> .40$ ). The 45 participating patients did also not differ from the 15 patients who underwent a gastric bypass operation with respect to gender, age, and preoperative BMI, but the BMI of 35.7 (6.1) of the included group at one year after LAGB was lower than the BMI of 42.0 (5.6) of the patients who underwent a gastric bypass operation later on (OR = 0.85,  $p = .004$ , 95% CI = 0.76 – 0.96).

## Measures

*Weight and height* were assessed in the St. Antonius Hospital. Preoperative and postoperative weights were determined during routine check-ups in the hospital. The body mass index (BMI) was calculated as weight in kilograms divided by the square of the height in meters ( $\text{kg}/\text{m}^2$ ).

*Quality of life.* The RAND short form-36 (SF-36) health survey [19] was used to measure physical component summary and mental component summary scores as a reflection of physical functioning, and mental well-being [20]. The RAND short form-36 (SF-36) questionnaire has adequate psychometric characteristics, including good construct validity, high consistency, and high test-retest stability [21].

*Depressive symptoms.* The Beck Depression Inventory (BDI) [22] was used to assess depressive symptoms. The BDI is an internally consistent and valid instrument. In this study, Cronbach's  $\alpha$  were .86 before surgery and .82 one year after surgery. The questionnaire includes 21 questions referring to the patient's feeling in the last week. Higher scores indicate more severe depressive symptoms.

## Statistical analyses

The score distributions of the quality of life dimensions and depressive symptoms were sufficiently normal to allow parametric statistics [23]. Weight loss one year after en six years after LAGB was defined as the percentage of Excess Body Mass Index Lost (%EBL) according to standard procedures [24].

Repeated measures analyses of variance were used to examine postoperative changes in BMI, physical functioning, and mental well-being scores.

Because age was significantly correlated with our main variables, partial concurrent correlation coefficients -adjusting for age- were calculated between all our main variables at the different time points.

Linear regression analyses were performed to examine whether quality of life and depressive symptoms before surgery and at one year after surgery predicted BMI outcome at six years. We performed 3 separate regressions for mental well-being, physical functioning, and depressive symptoms scores. ‘Baseline’ BMI and age were controlled for in the first step. A sample size of 45 gives the opportunity to examine the dependent variable as a function of three predictors (baseline BMI, age, and the quality of life or depressive symptoms score) as calculated with G\*power3 [25], 2-sided  $\alpha$ -level of .05, power (1- $\beta$ ) of at least .80.

To adjust for gender differences in the BMI outcome at six years we repeated the regression analyses for women only, but no differences were found. This method was chosen because only 7 men participated. Statistical significance was set at  $p < .05$ . Data were analyzed using SPSS for Windows (version 16.0, 2006, SPSS Inc, Chicago, IL).

## RESULTS

Table 1 shows the means and standard deviations of BMI, %EBL, physical functioning, mental well-being, and depressive symptoms at the different time points.

**Table 1.** Mean (*M*), and standard deviation (*SD*) of body mass index (BMI), percentage excess BMI loss (%EBL), physical functioning, mental well-being, and depressive symptoms at six months before, one year after, and six years after laparoscopic adjustable gastric banding

	6 months before <i>M (SD)</i>	1 year after <i>M (SD)</i>	6 years after <i>M (SD)</i>
<i>Weight</i>			
Body mass index	46.5 (4.9)	35.8 (6.1)	36.8 (6.2)
%EBL	-- --	51.6 (21.2)	45.4 (25.1)
<i>Quality of life</i>			
Physical functioning <sup>a</sup>	38.6 (12.0)	50.9 (9.0)	47.3 (11.3)
Mental well-being <sup>a</sup>	46.0 (11.7)	49.8 (12.2)	47.0 (14.3)
Depression symptoms <sup>b</sup>	14.1 (8.1)	8.1 (6.4)	-- --

<sup>a</sup> Higher scores indicate a better physical functioning and mental well-being

<sup>b</sup> Depression symptoms were measured only at baseline and one year after operation; a lower score indicates less depressive symptoms

Repeated measures analyses of variance showed significant changes in physical functioning ( $F(2, 44) = 35.09, p < .001$ ). Post hoc tests, with Bonferroni correction for multiple comparisons, revealed that physical functioning scores improved significantly between baseline and one year after LAGB ( $p < .001$ ), whereas a non-significant deterioration occurred between one year and six years follow-up ( $p = .055$ ). We did not find significant changes in mental well-being scores over time ( $F(2, 44) = 2.45, p = .09$ ).

Partial concurrent correlations (adjusting for age) between BMI, physical functioning and mental well-being at the repeated time points show that quality of life scores were neither correlated with BMI values before surgery (both  $p$ 's  $> .07$ ) nor with BMI values one year after surgery (both  $p$ 's  $> .05$ ). However, at six years after surgery, a better mental well-being ( $r = .38, p = .01$ ) and a worse physical functioning ( $r = -.38, p = .01$ ) were correlated with a higher BMI. Concurrent correlations between depressive symptoms and mental well-being were high ( $r > .70$ ) both before and one year after LAGB.

**Table 2.** Multiple regression analysis of Body mass index six years after laparoscopic adjustable gastric banding predicted by (a) mental well-being, (b) physical functioning, and (c) depressive symptoms before surgery and at year one postoperatively, after controlling for BMI at baseline and age

	BMI 6 years after surgery								
	Mental well-being			Physical functioning			Depressive symptoms		
	B	SE B	$\beta$	B	SE B	$\beta$	B	SE B	$\beta$
<b>Predictors before surgery</b>									
BMI	.51	.17	.40*	.57	.18	.45*	.46	.16	.37*
Age	.13	.10	.18	.18	.11	.24	.13	.08	.19
Predictor	.14	.07	.27*	.02	.08	.03	-.29	.09	-.40*
<b>Predictors 1 year after surgery</b>									
BMI	.73	.09	.72**	.68	.11	.67*	.69	.09	.69**
Age	.04	.07	.06	.14	.09	.19	.11	.06	.16
Predictor	.20	.05	.39**	-.05	.08	-.07	-.36	.09	-.38**

B: regression coefficient; SE B: Standard error of B;  $\beta$ : standardized regression coefficient

\*  $p < .05$ ; \*\*  $p < .001$

Predictors before surgery. For mental well-being:  $\Delta R^2 = .07, p = .047$ ; for physical functioning:  $\Delta R^2 = .001, p = .85$ ; for depressive symptoms:  $\Delta R^2 = .16, p = .002$

Predictors 1 year after surgery. For mental well-being:  $\Delta R^2 = .13, p < .001$ ; for physical functioning:  $\Delta R^2 = .004, p = .54$ ; for depressive symptoms:  $\Delta R^2 = .14, p < .001$

Table 2 shows the results of the regression analyses. Having entered BMI before surgery in the first step of regression analysis, in the subsequent steps the baseline-adjusted change of BMI is predicted.

The predictions were also adjusted for age. A lower mental well-being before surgery ( $F(3,40) = 4.22, p < .047$ ) and at one year after surgery ( $F(3,40) = 16.33, p < .001$ ) was associated with a decrease of BMI at six years postoperatively after controlling for baseline BMI (before surgery or at one year after surgery) and age. Similar effects were found for depressive symptoms: more depressive symptoms before surgery ( $F(3,41) = 11.21, p < .002$ ) or at one year after surgery ( $F(3,41) = 17.91, p < .001$ ) were associated with a decrease of BMI at six years postoperatively after controlling for baseline BMI and age.

We did not find any prospective associations for physical functioning or for any of the predictors -mental well-being, depressive symptoms or physical functioning- when using BMI at one year as outcome variable.

## DISCUSSION

The aim of our study was to examine quality of life as an outcome after bariatric surgery as well as a predictor of long-term (six years) weight outcome after LAGB. Our findings showed a significant increase of quality of life in the first year after LAGB for physical -but not for mental- quality of life. A lower mental well-being -and related depressive symptoms- forecasted a better weight outcome in the long-term.

Our study suggests that patients on average profit more in terms of physical functioning than in terms of mental well-being when undergoing bariatric surgery. Comparable to some earlier studies on the postoperative course of quality of life [10,26], our study shows that quality of life does not further improve with increasing postoperative time. This may reflect that patients are in a kind of ‘honeymoon’ phase one year after surgery, while they are more realistic at six years follow-up.

We expected that a lower quality of life could be a cue to further reduce weight loss. Indeed, we found a significant prospective association for low mental well-being with more weight loss at six years. This is in support of models predicting that the perceived threat of a disease heightens the likelihood of behavioral change and is in line with some previous studies in which depressive symptoms predicted a better weight outcome [27,28]. Comparable to previous studies examining the predictive effects of depressive symptoms on weight outcome after bariatric surgery, we found that mental well-being -or depressive symptoms- did not predict weight outcome at one year after the operation [29-31]. There

are several possible explanations for the finding that a lower mental well-being or more depressive symptoms may play a role in the maintenance of the amount of weight lost at six years follow-up. Distressed people may seek additional resources aimed at helping them to achieve a lower body weight (e.g., a dietician, bariatric nurse, or psychologist) or they may induce more helping behavior from bariatric professionals (e.g., nurses), who, for example, may make more appointments with these patients or tighten the gastric band more often. In a previous study, we found that patients with unsuccessful weight outcome after LAGB who underwent a conversion to a gastric bypass were the ones with the lowest mental well-being [16]. This supports the idea that patients may seek or are offered additional professional help from the bariatric team. However, our current results may also reflect that the patients who lost somewhat more weight at six years postoperatively were the ones who were less satisfied with the operation outcome one year after surgery as reflected in a lower mental well-being.

Future studies should examine why patients with a lower mental well-being or more depressive symptoms have a better long-term weight outcome as this may help in the guidance of patients after bariatric surgery.

The prospective design, a long-term follow-up of six years, and the use of reliable and validated questionnaires are assets of this study, but some weaker points should also be indicated. First, the sample size was small, because not all patients of our preoperative sample complied with our request to voluntarily fill-out and return the questionnaire at six years follow-up. This problem of drop-outs in long-term follow-up studies is also described in other studies [32,33]. However, the data of routine check-ups in the hospital suggested that there is no long-term weight loss difference between participating patients and the 'real' drop-outs (i.e., non-responders). Second, the sample consisted of only 7 men, so the results of this study cannot be generalized to men after LAGB. Third, the results do not generalize beyond patients who did not have a gastric bypass operation afterwards.

In conclusion, our findings show that after surgery for morbid obesity physical functioning improves more than mental well-being and that improvement of quality of life does not further continue during the five years to follow. A lower mental well-being and more depressive symptoms were associated with a better weight outcome at six years follow-up, which is in support of models predicting that the perceived threat or burden of a disease heightens the likelihood of behavioral change.

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## **Chapter 7**

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### **Conversion to gastric bypass in patients with unsuccessful weight loss after gastric banding may depend on mental quality of life**

Larsen, J.K., Zijlstra, H., Van Ramshorst, B., & Geenen, R. Conversion to gastric bypass in patients with unsuccessful weight loss after gastric banding may depend on mental quality of life. *Obesity Facts* 2010; 3: 127-30.

## ABSTRACT

**Background/Aims.** A low quality of life has been regarded a cue to action. Some patients with unsuccessful weight loss after laparoscopic adjustable gastric banding (LAGB) undergo a conversion of gastric banding to gastric bypass. This study examines whether patients who did or did not undergo conversion to gastric bypass differed in quality of life before and after gastric banding.

**Methods.** Of 34 patients with unsuccessful weight loss after gastric banding (Excess Body Mass Index Loss < 25%), 14 had a conversion to gastric bypass two years or more after gastric banding. All patients completed the RAND-SF36 quality of life questionnaire before gastric banding. After gastric banding, 24 patients (70.6%) filled out the RAND-SF36 at 6, 12, and 24 months.

**Results.** Pre-banding and post-banding mental quality of life was lower in the conversion compared to the non-conversion group.

**Conclusion.** Our results suggest that a relatively stable lower mental quality of life is a signal for further intervention. The bariatric team and patients should be aware that patient's mental health may play a role in the decision for conversion to gastric bypass. The possible mechanisms underlying this finding and limitations of the study are discussed.

## **INTRODUCTION**

Laparoscopic Adjustable Gastric Banding (LAGB) is a widely used restrictive bariatric operation [1]. Due to its reversibility and adjustability, it is considered to be the least invasive bariatric procedure [2]. However, the weight loss resulting from gastric banding is less compared a combined restrictive and malabsorptive procedure like gastric bypass [3]. Some patients with insufficient weight loss after gastric banding undergo conversion to gastric bypass, which often results in superior weight loss [4-6].

Clarification of the factors that affect the decision of patients and surgeons to convert to gastric bypass when gastric banding has led to unsuccessful weight loss will help the discussion about the appropriateness of these factors. To date, no studies have addressed this question. Health psychology theories emphasize that perceived consequences of obesity determine health behaviors [7,8]. A low quality of life is considered a 'cue to action', i.e. a signal that a change of health status is needed. In line with this idea, lower levels of quality of life have been associated with treatment seeking behavior in obesity [9]. Severely obese persons seeking surgical obesity treatment demonstrated on average the worst quality of life compared to other overweight and obese populations; even after adjustment for weight [10].

The aim of the present study was to examine whether patients who did or did not undergo conversion to gastric bypass differed in pre-conversion quality of life. Quality of life was assessed before gastric banding and several times after gastric banding, but before conversion. We hypothesized that 'unsuccessful' patients who have a conversion operation are the ones with a lower pre-conversion quality of life.

## **MATERIALS AND METHODS**

### **Patients and Procedures**

Between November 2000 and April 2004, 156 patients were subjected to a LAGB procedure at the St. Antonius Hospital Nieuwegein, the Netherlands, using the Lap-Band® system (INAMED Health, Santa Barbara, CA, USA), following screening by a bariatric surgeon, an endocrinologist, a psychologist, and a dietician. Surgical indications were a BMI  $\geq 40$  or a BMI between 35 and 40 with serious comorbidity. The operation was performed according to the techniques described by Belachew et al [11]. Weight observations after surgery were recorded in the hospital. Weight outcome was defined as

percent of Excess Body Mass Index Loss (% EBL) according to standard procedures [12]. We selected patients with unsuccessful weight outcome two years or more after LAGB (defined as EBL < 25%) out of a group of 113 patients who participated in a survey study, which has received the necessary ethical approval [13]. We used the last weight observation after LAGB and if applicable before conversion to gastric bypass that was recorded. Thirty-four out of the 113 patients (30%) had an unsuccessful weight outcome (EBL < 25%). Of these ‘unsuccessful’ patients, 14 underwent conversion to gastric bypass. There were no differences in the %EBL between the conversion group ( $M = 11.7$ ;  $SD = 10.9$ ) and non-conversion group ( $M = 12.5$ ;  $SD = 13.5$ ),  $t(32) = 0.2$ ,  $p = .85$ . Because for the conversion group, the post-banding weight evaluation ended when the bypass operation was performed, the postoperative follow-up interval recorded in months of the last weight observation was longer for the non-conversion group ( $M = 57.9$ ;  $SD = 17.4$ ) compared to the conversion group ( $M = 45.0$ ;  $SD = 14.8$ ),  $t(32) = 2.2$ ,  $p = 0.03$ . The conversion operation was conducted on average 48 months ( $SD = 15.6$ ; Range = 23.7 - 77.9) after gastric banding. The groups did not differ on demographic characteristics, as shown in Table 1.

**Table 1.** Pre-surgical demographic characteristics of the conversion and non-conversion groups

	Conversion	Non-conversion	Test variable
Patients, n	14	20	
Female, n : male, n	13:1	16:4	$\chi^2 = 1.09$
Age: mean (sd) years	39.4 (10.2)	41.9 (8.3)	$t = .77$
Marital status, (% married)	78.6%	70.0%	$\chi^2 = 0.31$
BMI: mean (sd) kg / m <sup>2</sup>	49.5 (6.2)	49.4 (7.3)	$t = -.06$
Education level, n			$\chi^2 = 0.99$
Primary	2	1	
Secondary	11	18	
Tertiary	1	1	

None of the group differences was significant

All patients completed the quality of life measure before gastric banding. After gastric banding, 24 patients (70.6%) filled out the quality of life measure at 6, 12, and 24 months post-banding and 10 of these 24 patients were in the conversion group. There were no differences between the patients who did or did not complete all postoperative quality of life measures on demographic characteristics, BMI, or pre-banding quality of life ( $p > .10$ ).

For the 24 patients who filled out all postoperative quality of life measures, the conversion operation was conducted on average 53.9 months ( $SD = 14.6$ ; Range = 40.2 –

77.9) after gastric banding and 28.5 months ( $SD = 14.5$ ; Range = 13.0 – 51.2) after patients filled out the last quality of life measure. Repeated measures analyses of variance examining %EBL at 6, 12, and 24 months post-banding showed no group differences in the level ( $F = 0.81$ ,  $p = 0.38$ ) or change ( $F = 1.15$ ,  $p = 0.29$ ) of %EBL across the repeated measurements for the 24 patients who filled out all postoperative quality of life measures. Mean %EBL across measurements was 31.3 (C.I. = 23.6-39.0) for the non-conversion group and 26.1 (C.I. = 16.9-35.2) for the conversion group. There were some patients for whom the %EBL from 6 to 24 months after gastric banding was higher than 25%, but all patients fulfilled the 25% criterion during the last weight observation recorded.

### **Quality of Life Measurements**

To measure quality of life, the RAND-36 was used [14]. Quality of life scores of the separate subscales were expressed as mean deviations from a general Dutch norm population [14]. The lower scores reflect poorer health as compared to age and gender-specific norms. We also calculated two summary components, aggregating scores from eight subscales of the Rand-36 into two summary scores: Physical Component Summary (PCS or physical health) and Mental Component Summary (MCS or mental health) [15]. Raw scale scores of the Rand-36 were transformed into Z-scores, using Dutch means and standard deviations, which were multiplied with the US factor score coefficients and summed over all eight subscales (US factor scores were used to facilitate international comparisons). Finally, t-scores were calculated by multiplying the obtained PCS and MCS sums by 10 and adding 50 to the product to obtain transformed summary scores that are normally distributed with a mean of 50 and a standard deviation of 10.

### **Statistical Analysis**

Though the sample sizes were rather small, the score distributions of all quality of life dimensions were sufficiently normal to allow parametric statistics [16]. The quality of life before gastric banding of the conversion and non-conversion groups were examined with independent samples *t*-tests for all 34 patients. In 24 patients, repeated measures analyses of variance were used on pre-banding and 6, 12 and 24 post-banding quality of life with group (conversion versus non-conversion) as between-subject factor. Effects sizes (Cohen's *d*) were computed. Effect sizes between 0.2 and 0.5 reflect a small effect, between 0.5 and 0.8 a medium effect, and above 0.8 a large effect [17]. Analyses were performed with SPSS 15.0. *P*-values of less than .05 were considered to be significant.

## RESULTS

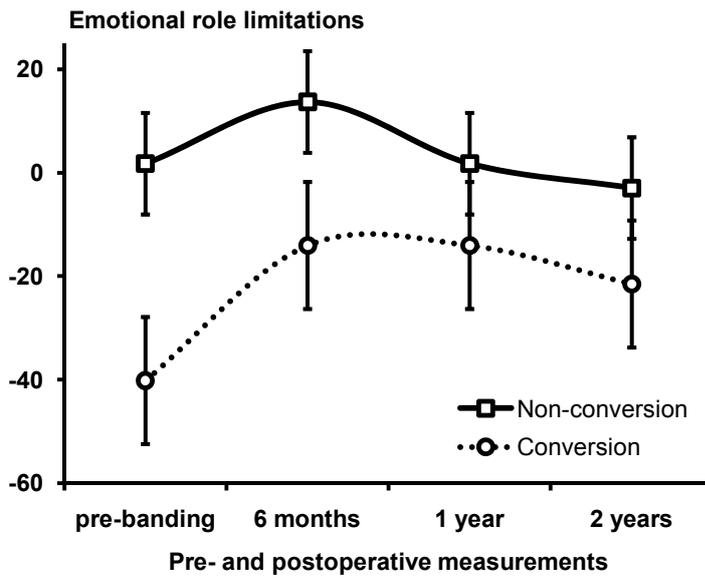
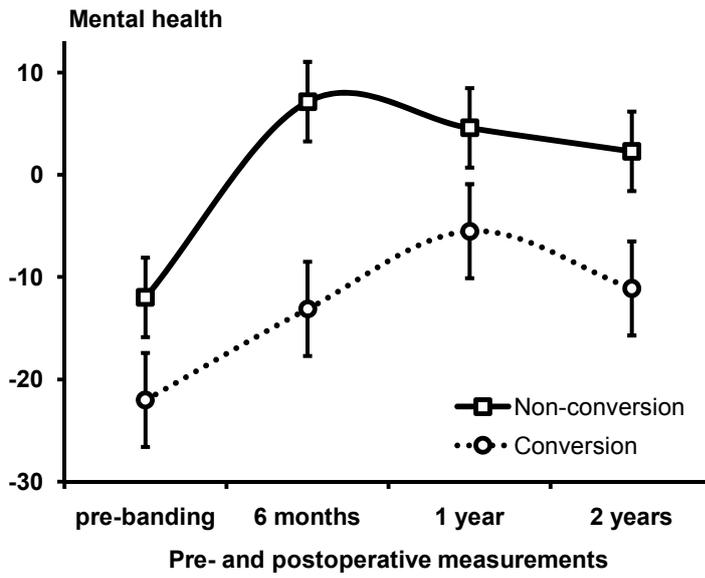
Table 2 shows the pre-banding quality of life for the conversion and non-conversion groups. Patients with and without conversion did not differ significantly on pre-banding social and physical quality of life, but the conversion group showed a worse pre-banding mental quality of life, as reflected in significantly lower scores on the subscales ‘emotional role limitations’ ( $p < .05$ ) and ‘mental health’ ( $p < .05$ ), and a nearly significant lower score on the Mental Component summary score ( $p = .05$ ). The pre-banding significant effects were moderate to large with effects sizes varying between .71 and .77 (Cohen’s  $d$ ). Also repeated measures analyses of variance that examined quality of life across all measurements showed lower levels on the subscales ‘emotional role limitations’ ( $F = 5.45$ ,  $p = .03$ ), ‘mental health’ ( $F = 9.15$ ,  $p = .006$ ), and on the Mental Component Summary score ( $F = 8.86$ ,  $p = .008$ ) for the conversion group. These effects were all large in terms of effects sizes (Cohen’s  $d > 1$ ).

**Table 2.** Mean (standard deviation) pre-surgical quality of life of the conversion and non-conversion groups

	Conversion		Non-conversion		<i>t</i>
	<i>n</i> = 14		<i>n</i> = 20		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Physical functioning	-51.6	25.5	-39.8	27.5	1.26
Social functioning	-39.4	4.0	-37.5	15.9	0.50
Physical role limitations	-43.2	41.9	-26.0	41.1	1.17
Emotional role limitations	-38.2	48.6	-3.8	41.0	2.19*
Mental health	-21.9	14.1	-13.9	7.5	2.15*
Vitality	-20.8	10.8	-16.7	9.4	1.18
Pain	-24.9	28.8	-43.9	34.1	-1.69
General health	-17.7	10.7	-17.6	10.7	.04
Mental Component Summary score	38.3	15.5	48.5	12.9	2.00†
Physical Component Summary score	34.0	10.5	35.3	11.7	0.32

\*  $p < .05$ , †  $p = .05$

Figure 1 shows the scores for ‘mental health’ and ‘emotional role limitations’. There were no differences in the change of quality of life across the four repeated measurements between the conversion and non-conversion group ( $p > .10$  for all quality of life measures). Ancillary analyses showed that pre-banding patients with conversion also reported more lifetime psychological treatment (64.3%) compared to the non-conversion group (30.0%),  $\chi^2 = 3.9$ ,  $p = .048$ . We also repeated our analyses for females only and same effects were found.



**Figure 1.** Pre-banding and post-banding scores on ‘mental health’ and ‘emotional role limitations’ for the conversion and non-conversion group

## DISCUSSION

This is the first study to examine a psychological characteristic of patients who did or did not undergo conversion to gastric bypass for unsuccessful weight loss following gastric banding. The mental quality of life of patients who had a conversion to gastric bypass proved to be enduringly worse compared to those who did not have a conversion. Our results suggest that a low mental quality of life is a signal for further intervention.

We expected that a worse quality of life could be a ‘cue to action’ [7,8], in this case conversion to gastric bypass. Notably, we found a significant effect for mental quality of life, but not physical or social functioning. This may suggest that especially psychologically distressed patients are more likely to seek additional surgical treatment or to accept conversion to gastric bypass when it is offered. Another hypothesis is that patients with relatively good mental strength do not choose for gastric bypass, because they believe that they are still capable to restrict food intake with help of the gastric band. Besides decisions of the patient, also decisions of the surgeon may play a role. Perhaps the decision to offer gastric bypass as an additional intervention is postponed for patients who are considered to have relatively high mental strength.

Our study has some limitations. First, we have no insight into the hypothesized mechanisms underlying the finding that ‘unsuccessful’ patients with a relatively stable low mental health undergo conversion. Second, The sample sizes is small, although it was large enough to detect a moderate to large difference in pre-banding mental quality of life and overall large effects combining pre-banding and post-banding scores. Third, although our results convincingly indicate relative stability in mental health among our groups, we have no information on mental quality of life just before conversion.

Future studies should report our study results in larger samples ad examine the hypothesizes mechanisms underlying our finding. Overall, the bariatric team and patients should be aware that patient’s mental health may play a role in the decision for conversion to gastric bypass.

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## **Chapter 8**

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### **Summary and General Discussion**

The aim of this thesis was to examine cognitive and emotional processes that promote or obstruct a successful outcome after bariatric surgery for morbid obesity. Particular attention was given to cognitive self-regulation, outcome expectations and satisfaction with the operation outcome, emotion processing and emotion regulation, and quality of life. More insight into the factors that affect the outcome of bariatric surgery provides the tools to offer tailored intake screening, and postoperative care, education and therapy to patients with a psychological high-risk profile with an adverse outcome, which will reduce comorbidity and improve the long-term weight outcome. This concluding chapter will summarize and discuss the main findings of the cross-sectional and prospective studies of this thesis. Methodological considerations will be discussed as well as recommendations for future research and clinical implications for the care of patients with morbid obesity after bariatric surgery.

## **PSYCHOLOGICAL DETERMINANTS OF OUTCOME**

The predictive value of preoperative and postoperative psychological variables was examined.

### **Predictive value of preoperative factors**

Not all patients achieve a successful weight outcome after bariatric surgery [1-3]. It would be helpful to pre-operatively identify those patients who will or will not achieve a successful weight outcome. This information could be used in intake screening to decide on the operation and the need for additional postoperative care. An aim of this thesis was to examine the predictive value of preoperative psychological factors on the weight loss outcome after bariatric surgery. Using general theories from health psychology we expected a predicting value on postoperative weight loss for preoperative outcome expectations, self-regulation cognitions, and quality of life.

In our qualitative study in patients with an unsuccessful weight outcome (chapter 2), we observed that the patients hoped and expected preoperatively that the gastric band would do the work for them, that it would prevent them from overeating. After surgery, these patients were disappointed with the postoperative outcome. Theories in the field of health psychology [4-6] and observations in nonsurgical weight loss interventions [7-9] suggested that outcome expectations guide decisions to initiate health behavior change. Specifically, positive expectations about the consequences of behavior change were thought to promote health behavior [4]. However, this hypothesis was not confirmed. In

our quantitative study in the whole group of successful and unsuccessful patients, we found that patients' preoperative expectations of psychological outcome were neither related to postoperative psychological outcomes nor to weight loss in the first year after surgery (chapter 5). This suggests that, during the weight loss phase after bariatric surgery, the effect of the gastric banding on weight loss is more important than the supporting effect of psychological variables on the weight loss. While the idea that positive outcome expectations guide decisions to initiate behavior change appears to apply to heterogeneous groups with less severe obesity [7-9], this idea did not apply to our group in which the surgical intervention was a final solution after a long history of unsuccessful behavioral attempts to lose weight.

Likewise, we found in our study based on theories about self-regulation [6] and self-efficacy [10] (chapter 4), that self-regulation cognitions, the beliefs about one's capability to regulate health behavior and the course of an illness, change positively one year after the operation. More weight loss was correlated with more self-efficacy postoperatively, but preoperative self-regulation cognitions did not predict postoperative weight loss outcome. Before the operation, self-regulation cognitions of the patients reflected a helpless and pessimistic state. This condition has been called learned helplessness [11,12]. Many patients with morbid obesity will have learned that repeated efforts to lose weight failed and that the situation has become unchangeable. Our findings are in line with findings from other bariatric operation studies, showing that preoperative psychiatric disturbances [13], personality characteristics [14,15], and preoperative binge eating [16] do not predict postoperative weight outcome. Our obese sample was different from overweight samples after dietary interventions in the sense that patients were more severely obese. Whatever the exact mechanisms, our results strongly suggest that operatively induced effects of weight loss after gastric banding are achieved independently of preoperative self-regulation cognitions.

Some hospitals provide a program to help patients deal with life as a non-obese person [17]. The obligation to participate in a preoperative program as an inclusion criterion for bariatric surgery may perhaps prevent inclusion of candidates who do not have the skills to postoperatively maintain the weight reduction that was induced by the gastric band. However, our results challenge the validity of using the outcome of a preoperative weight loss program as an inclusion criterion for bariatric surgery patients. As also suggested by other studies [18-22], our results as shown in chapter 2, 4 and 5 indicate that the postoperative weight outcome could not be predicted from preoperative cognitive variables. One previous study even concluded that the impact of bariatric surgery appears sufficiently potent to negate whatever preoperative differences might otherwise affect weight management [19]. This suggests that it could be time to cease the search for

surgical outcome predictors and focus instead on improving postoperative guidance of patients who do not achieve a successful outcome. However, this conclusion appears to relate predominantly to preoperative predictors of weight outcome. In a study not included in this thesis, we examined whether physical exercise cognitions before surgery predict physical exercise after the operation. Perceiving less exercise benefits and less confidence in exercising before surgery predicted less physical activity two years after surgery [23]. Thus, while the weight outcome is not predicted by preoperative cognitive variables, it has been suggested that targeting exercise cognitions before surgery might be relevant to improve physical activity.

Quality of life is often assessed as a secondary outcome measure after bariatric surgery, but it could also be considered a predictor of health behavior. We hypothesized in line with the Health belief model that a lower quality of life is ‘a threatening cue to action’, i.e., a signal that a change of health status is needed, while a good quality of life is a signal that no further action would be needed. Conform our hypotheses, we found a significant prospective association of low mental well-being with more long-term weight loss in our study on quality of life (chapter 6). Moreover, in our study in patients with unsuccessful weight outcome who did or did not undergo a conversion to gastric bypass after LAGB (chapter 7), we found that in the group with conversion the pre-gastric banding mental quality of life was lower compared to the group without conversion. Both findings are in support of the suggestion that a relatively low mental quality of life is a cue to action. We hypothesized that depressive symptoms would be associated with less weight loss. According to the limited strength model, self-regulation problems in one sphere (e.g., regulating negative affect) diminishes the resources available for self-regulation in other spheres [24]. Moreover, according to affect regulation models, depressed individuals overeat in an effort to provide distraction from negative feelings. However, we found no evidence for these models in this group of bariatric surgery patients. We even found that increased depressive symptoms -which may correlate with but is not similar to depression- before surgery were associated with more long-term weight loss. Depressive symptoms are highly related to mental quality of life, which suggests that both reflect more or less the same burden. Although there is mixed evidence on the predictive value of depressive symptoms for weight outcome in bariatric surgery patients [25-29], our findings are in line with some previous studies in which depressive symptoms predicted a better weight outcome [25,26]. Comparable to previous studies examining the predictive effects of depressive symptoms on weight outcome after bariatric surgery, we found that either mental well-being or depressive symptoms did not predict short-term weight outcome [27-29]. There are several possible explanations for the finding that a lower mental well-being or more depressive symptoms may play a role in the maintenance of the amount of weight

lost at long-term follow-up. Distressed people may seek additional resources aimed at helping them to achieve a lower body weight or they may induce more helping behavior from bariatric professionals.

The only partly predictive value of psychological variables with respect to the outcome of bariatric surgery, suggests that general theories in health psychology do not hold for bariatric surgery patients. In this respect the patients with morbid obesity differ from overweight patients. That operatively induced effects of weight loss after bariatric surgery appear to be achieved independently of preoperative self-regulation cognitions and outcome expectations implies that the preoperative psychological variables cannot be used to indicate who will achieve a good weight outcome, needs extra attention, or should be selected for surgery. That patients with a lower mental quality of life or depressive symptoms before surgery tend to achieve a better long-term weight loss outcome might reflect that the weight of patients with a good postoperative quality of life attracts too less attention from health care workers. Since bariatric surgery is necessary in this severely obese group to achieve weight loss and the impact of preoperative psychological difference on the outcome of bariatric surgery is low, the operation is necessary to discover who will and who will not achieve a good weight outcome.

### **Predictive value of postoperative factors**

Besides the prospective study of preoperative factors, we examined the predictive value of postoperative psychological factors on weight loss outcome after bariatric surgery. General theories from health psychology lead to the more or less opposite predictions that both satisfaction with the outcome and a lower quality of life could be predictors of more weight loss in the long-term.

Based on the premise that the initiation and maintenance of behavior change involve different decision processes [4], positive expectations of the consequences of behavior change are thought to guide the initiation of health behavior, whereas satisfaction with the outcome guides decisions on the maintenance of health behavior [30]. The second part of this theory suggests that people strive to maintain satisfaction, that is a discrepancy between their favorable current state and an undesired prior state. In the current thesis postoperative satisfaction was defined as postoperative appraisal of the psychosocial status after bariatric surgery minus the appraisal of the preoperative psychosocial status. Our hypothesis that satisfaction with the outcome after one year would be associated with weight loss maintenance in the long-term was not confirmed (chapter 5). Our definition of satisfaction included the postoperative appraisal of the preoperative situation as a reflection of an undesired prior state. The retrospective perception of the preoperative situation is

considered more important for current satisfaction than the actual situation before the operation. Our ancillary analyses showed that five of the seven perceived psychosocial states one year after the operation were linked to weight loss during the first but not the second year. This result suggests that satisfaction with the outcome is a consequence of weight loss, rather than weight loss maintenance being a consequence of a psychosocial state.

Whereas one theory predicts that postoperative satisfaction with the psychosocial outcome predicts weight loss maintenance [4], from the Health belief model [5] more or less the contrary could be expected. Our definition of satisfaction is most close to the 'perceived benefits' definition in the health belief model. According to this model, the perceived threat of a disease and the perceived benefits versus barriers to behavioral change determine the likelihood of behavioral change. In the chapters 6 and 7, we focused on 'the perceived threat' component and proposed that a lower quality of life one year after operation may be 'a threatening cue to action' resulting in more weight loss. A lower mental well-being one year after the operation was indeed associated with a better weight loss outcome in the long-term (chapter 6). Moreover our study in patients with and without conversion to gastric bypass after LAGB (chapter 7) showed that in the group with a conversion to gastric bypass mental quality of life was lower compared to the group without the conversion. Notably, we found a significant effect for mental quality of life, but not physical or social functioning. This may suggest that especially psychologically distressed patients are more likely to seek additional surgical treatment or to accept conversion to gastric bypass when it is offered. Another hypothesis is that patients with relatively good mental strength do not choose for gastric bypass, because they believe that they are still capable to restrict food intake with help of the gastric band. Besides decisions of the patient, also decisions of the surgeon may play a role. Perhaps the decision to offer gastric bypass as an additional intervention is postponed for patients who are considered to have relatively high mental strength. These findings are in support of the notion that a lower post-banding mental quality of life is a cue to action. The observation that patients with a higher quality of life do not ask for an additional intervention suggests that a relatively good well-being may be a risk factor in terms of the long-term weight loss and thus co-morbidity. This does not suggest that postoperative appraisals of mental well-being after bariatric surgery should be used to take clinical decisions with respect to new weight loss measures. Moreover, it is obvious that mental well-being as such is a valued aspect of persons. However, clinicians should be aware that a good quality of life may hamper the ultimate outcome of surgery.

The only partially confirmed predictive value of postoperative psychological variables, support the idea that general theories in health psychology do hardly hold for

bariatric surgery patients. Our results suggest that patients with morbid obesity differ from overweight patients who do not have a surgically established aid for weight control. The implication of our studies is that only a lower mental quality of life or depressive symptoms are somewhat predictive of post-operative weight loss.

### **Emotion processing and emotion regulation**

It has been supposed that although influenced by genetics, the worldwide obesity epidemic appears to be driven principally by behavioral and environments factors. Lifestyle factors, including high energy diets and lack of physical activity, seem to be main contributors to the energy imbalance that causes overweight and obesity [31]. Until now, little attention has been given to the role of emotions in the onset and persistence of overweight and obesity. In our qualitative study in patients with an unsuccessful weight outcome (chapter 2) we observed that participants frequently attributed the reason for their weight gain to an emotional setback that was said to cause anxiety, depression, and isolation. Stressful life events and mental health problems triggered unhealthy food intake in them. Overeating was their common strategy for coping with difficult emotions. In other studies it was suggested that the link of obesity with emotions and emotion processing and regulation could also reflect the emotional consequences of obesity. Obese persons tend to feel distress because of stigmatization and discrimination [32]. Many obese people described feeling stigmatized and blamed by the simplicity of health messages in public campaigns and the lack of realistic solutions [33]. This may act as a vicious circle in which distress causes by stigmatization and functional problems triggers the coping mechanism of overeating.

As suggested in our qualitative study, also in quantitative studies a higher body weight, particularly morbid obesity, has been associated with emotional eating, the tendency to eat when experiencing negative affect [34,35]. Emotional eating may indicate that general ways to process and regulate emotions are disturbed, which has been indicated in some studies [35-38]. Our study on emotions (chapter 3) was the first to quantify disturbances in affect, emotion processing and emotion regulation in women with morbid obesity. Female patients with morbid obesity showed before operation less positive and more negative affect, more difficulty identifying feelings, and more suppression of emotions than women from the general population. Thus, worse affect, and both less healthy emotion processing and unhealthier emotion regulation were present in the group with morbid obesity. More severe worse affect and unhealthy emotion processing were associated with emotional eating. These correlational results are in support of the suggestion that unhealthy emotion processing and regulation may play a role in severe

obesity and it indicates the possible relevance of emotion processing and emotion regulation as initiating or perpetuating mechanisms in morbid obesity. The role of emotions and ways of dealing with emotions as predictor of outcome after bariatric surgery should be examined. When the role of emotions processing and regulation turns out to be important in the postoperative interval, this offers new possibilities in helping patients with morbid obesity after bariatric surgery.

## **METHODOLOGICAL CONSIDERATIONS**

In the discussion sections of the empirical studies comprising this thesis, attention was paid to the methodological limitations and strengths. In this section the most important issues are discussed briefly.

### **Patients lost to follow-up**

A considerable part of the patients was lost to follow-up, because they did not return the questionnaires even after a reminder. This was an ethic problem, because their participation was voluntary, and obviously we did not want patients to force to participate. Two studies on data of routine check-ups in the hospital [39,40] suggested that there was no long-term weight loss difference between participating patients and the non-responders, but there was an almost significant difference for age, younger patients were more often drop-outs. The problem of drop-outs in long-term follow-up was also described in a study on bariatric patients of the same hospital from which the patients are included in the studies of this thesis. It was found that patients lost to follow-up were more likely to have a poor weight loss outcome postoperatively [41]. Thus, likely patients with better postoperative weight loss outcomes and a higher age have participated more often in the studies of the current thesis. The restriction of range due to loss of patients with a poor weight loss outcome may have prevented the finding of more significant prospective associations in this thesis.

### **Generalizability**

The studies of this thesis were conducted within the context of an ongoing research program with evaluations at different moments in time. As a consequence, different patients were included in the distinct studies. The different samples of the study have consequences for the generalizability of the findings. In all studies LAGB patients were included, but two studies (chapter 3 and 7) also included patients that underwent a gastric

bypass operation. Moreover, the number of men was small, in one study (chapter 2) only patients with an unsuccessful weight loss were included, and in another study (chapter 3) only female patients participated. Furthermore, only adult samples were examined, whereas bariatric surgery is an increasingly used strategy for young people [42]. This restricted representativeness of the distinct study samples hampers generalizability. Moreover, the results cannot be generalized to all bariatric patients such as people with morbid obesity who do not apply for surgery or overweight groups other than the adult group with morbid obesity [43-45]. For example psychological predictors of weight loss could be more powerful in obese non-surgical intervention groups, than in bariatric surgery patients in which the operation may overrule individual differences in psychological features.

### **Study design**

The studies of this thesis have some assets, such as the prospective design in four out of six studies, with a long-term follow-up varying from one year (chapter 4), two years (chapter 5 and 7) to six years (chapter 6). One study has a cross-sectional design, which prevents the analyses of causal relationships, but the strength of this study was that there was a comparison with a general population reference group. In the five quantitative studies commonly used self-reported questionnaire on cognitions and emotions were applied. One study (chapter 2) with a small sample size had a qualitative design, but in this study the voices of the patients were heard by means of a semi-structured interview.

A disadvantage of the current studies is that these are not controlled. The preferred methodological design would have been a randomized double-blind placebo-controlled prospective design including a bariatric surgery intervention and a fake operation. This would have led to firmer conclusions regarding the cause of postoperative changes. However, such a randomized double-blind controlled trial is not possible from a medical-ethical point of view, because of the necessity to intervene in these people with severe comorbidity and life-threatening health risks.

Emotion processing and emotion regulation can be assessed by means of self-report questionnaires [46-49] as well as by means of observations and experimental tasks [47,50-52]. The study on emotion processing and emotion regulation in this thesis employed questionnaires to assess the rather stable aspects of emotion processing and emotion regulation. Future research may use multi-informant methods and approaches, including for instance observations and a dynamic systems approach, which will give more insight into emotion regulation processes [53].

It has been debated whether emotional eating should be measured by self-report [54,55]. It has been observed that people who perceive themselves as emotional eaters do not increase food intake during emotional encounters in the laboratory [56]. This observation may be considered a challenge to the validity of using the self-reported questionnaire ‘Dutch Eating Behavior Questionnaire (DEBQ) [57,58]’ to measure emotional eating. However, it is unclear whether a questionnaire or a laboratory study offers the most valid representation of negative emotions and emotional eating. Induced short-lived negative emotions in the laboratory represent a completely different state than more enduring emotions as assessed with questionnaires. Moreover, emotions are tightly intertwined with emotion processing and regulation. Our study was the first to quantify disturbances in affect, emotion processing and emotion regulation in women with morbid obesity. Emotional eating was associated with negative affect and difficulty identifying feelings. The observation of this association is an important step. Other designs are needed for inferences of the causal relations between the variables beyond the chicken-egg level.

The Health belief model [5] and theory of Rothman [4] both include forecasts of a health behavior change. These theories have some similarities, for example the perceived benefits in the Health belief model resemble satisfaction in the Rothman theory, and the threat and cue to action in the Health belief model could be seen as the opposite of satisfaction in the Rothman theory. Then our findings suggest that the ‘cue to action’ hypothesis is more strongly supported than the ‘satisfaction’ hypothesis. However, a weak point in our studies on the theory of Rothman (chapter 5) and the Health belief model (chapter 6 and 7) was the use of different questionnaires, the RAND short form-36 (SF-36) health survey [59] and the “Obesity Psychosocial State Questionnaire (OPSQ)” [60]. Moreover, different definitions of satisfaction and cue to action were used. The OPSQ was developed by our research group, to measure the actual, expected, and past psychosocial states in one session. The use of different questionnaires could have influenced the outcomes of our studies, and complicates the comparison of the outcomes. Finally, a limitation of the prospective studies on cognitions (chapter 4 and 5) was that both have a short-term follow-up, one year and two years respectively.

## **FUTURE RESEARCH**

The role of emotion processing and emotion regulation as predictors of outcome in bariatric surgery patients has not yet been examined. Chapter 3 shows that female bariatric patients may process their emotions in an unhealthy way, which may play a role in disturbed eating behavior and indicates the possible relevance of emotion processing and

emotion regulation as initiating or perpetuating mechanisms in morbid obesity. Future prospective longitudinal research should explore the predictive role of emotion processing and emotion regulation on weight outcome in overweight and obesity and after bariatric surgery.

Another observation that should be further examined is the association between a low mental quality of life and more long-term weight loss. It was suggested that the mental burden of obesity is considered a threat that promotes health behavior. However, several mechanisms may underlie this correlation. It could reflect an aspect of personality such as the tendency to live a life by avoiding adverse situations (behavioral inhibition system), it could reflect a co-morbidity, or it is possible that people become unhappy as a consequence of not being able to eat freely. Such mechanisms should be examined in future studies.

The studies in this thesis focused on individual factors and single predictors. Future studies should also focus on contextual factors and multiple predictors, and the combination of contextual and individual factors. Considering that obesity rates have risen dramatically in a relatively short time frame, genetic factors are not seen as playing a predominant role in the current obesity epidemic. There is growing consensus among experts that the environment is driving the obesity epidemic [61]. Individuals differ in their food reward system, and eating behavior in response to environmental stimuli is proposed to be influenced by associative neuronal networks. According to dual-process models, such as the reflective-impulsive system model, human behavior is not only the result of automatic, associative learning, but also of a more intentional, reflective system determining whether automatic impulses are being controlled [62]. Dual-process frameworks focussing on the combination of high food reward (automatic system) and low inhibitory capacity (control system) have been used to explain eating behavior [63,64]. Such models may also be of relevance to understand the etiology, persistence, and postoperative course of morbid obesity.

This thesis showed that general theories in health psychology do not automatically hold for bariatric surgery patients. People with morbid obesity actually need surgery as a means to be helped in inhibitory control. Future studies could examine whether and how the combined influence of the automatic system of food reward and control system of inhibitory capacity predict eating behavior in morbid obesity before and after bariatric surgery.

## CONCLUSION AND CLINICAL IMPLICATIONS

The studies in this thesis examined cognitive and emotional factors that predict or obstruct a successful weight outcome after bariatric surgery. Virtually all variables, including the psychological, reflect a severely worse state before, than after bariatric surgery. This indicates that bariatric surgery not only accomplished weight loss and a reduction of comorbidity, but also changes in well-being functioning, and cognitions.

A premise of this thesis was that the appropriate tools to improve the outcome of bariatric surgery were to be found by examining cognitive and emotional factors that impact on eating behavior of patients after bariatric surgery. The psychological aspects, self-regulation, outcome expectations, and satisfaction were not found to be predictors of the short-term or long-term weight-loss outcome after the operation. The only predictor for more weight loss in the long-term found in this thesis was a lower mental quality of life. Patients with a lower mental quality of life preoperatively or short-term postoperatively had a better weight loss outcome in the long-term.

With respect to clinical implications, the most important issue is whether our findings can be used as to improve intake screening and long-term weight loss outcome after bariatric surgery. The only partly predictive value of psychological variables with respect to the weight loss outcome of bariatric surgery, suggests that general theories in health psychology do not hold for bariatric surgery patients. In this respect the patients with morbid obesity differ from overweight patients. That operatively induced effects of weight loss after bariatric surgery appear to be achieved independently of preoperative self-regulation cognitions, outcome expectations, and satisfaction implies that preoperative psychological variables cannot be used automatically as intake screening or gatekeeper to indicate who will achieve a good weight outcome, needs additional counseling, or should be selected for surgery. The second clinical implication is that patients with a higher preoperative and postoperative mental quality of life are at risk for a poorer long-term weight outcome. The bariatric team should be aware that weight loss maintenance may be difficult in this specific group.

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## **Samenvatting (Dutch summary)**

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Obesitas is een wereldwijd gezondheidsprobleem, dat steeds verder toeneemt. Het wordt gekenmerkt door extreme vetstapeling in het lichaam die leidt tot chronische ziekten, zoals diabetes, hart- en vaatziekten en kanker en resulteert in een kortere levensverwachting. Daarnaast kan obesitas aanleiding geven tot depressie en stigmatisering met als gevolg een ernstig verminderde kwaliteit van leven.

De meest gebruikte classificatie van overgewicht en obesitas voor volwassenen is de BMI (Body Mass Index); het lichaamsgewicht in kilo's gedeeld door het kwadraat van de lichaamslengte in meters ( $\text{kg/m}^2$ ). Een BMI tussen de 19 en 25  $\text{kg/m}^2$  duidt op een normaal gewicht, een BMI tussen de 25-30  $\text{kg/m}^2$  geeft overgewicht aan, een BMI tussen 30-40  $\text{kg/m}^2$  wijst op obesitas en een BMI groter of gelijk aan 40  $\text{kg/m}^2$  duidt op morbide obesitas. De BMI-categorieën zijn risico-indicatoren voor chronische ziekten, met morbide obesitas als hoogste risico voor met lichaamsgewicht samenhangende ziekten. In de Verenigde Staten heeft momenteel 35% van de bevolking obesitas en 6% morbide obesitas; in Nederland heeft nu 13% van de vrouwen en 11% van de mannen een BMI boven de 30  $\text{kg/m}^2$  (obesitas of morbide obesitas).

Bariatrische chirurgie, operatieve behandeling met als doel gewichtsreductie, is de meest effectieve en aangewezen behandeling voor morbide obesitas. Er zijn drie soorten operaties: een restrictieve, malabsorptieve en een combinatie van restrictieve en malabsorptieve operatie. Een restrictieve procedure beperkt de *inname* van de voeding; een malabsorptieve procedure vermindert de *opname* van voedingsstoffen door het lichaam. Bij een maagband (laparoscopic adjustable gastric banding), een restrictieve procedure, wordt operatief een instelbaar siliconenbandje rond de overgang van de slokdarm naar de maag geplaatst. Bij een maagverkleining (gastric bypass), een combinatie van een restrictieve en malabsorptie procedure, wordt de maag operatief verkleind en verbonden met de dunne darm, die op deze wijze functioneel wordt ingekort.

Na bariatrische chirurgie heeft tweederde van de patiënten een succesvol gewichtsverlies, echter bij ongeveer één op de drie patiënten blijft het gewichtsverlies achterwege terwijl de operatie technisch gelukt is. De uitkomst van bariatrische chirurgie, vooral bij een maagband, hangt niet alleen af van het slagen van de operatie, maar ook van de mate waarin de patiënt zich goede eetgewoonten en een gezonde levensstijl eigen maakt. Een deel van de patiënten lukt het niet om tot deze eet- en leefstijlveranderingen over te gaan. Het doel van dit proefschrift was onderzoek te doen naar cognitieve en emotionele factoren die een succesvol gewichtsverlies na bariatrische chirurgie kunnen bevorderen of belemmeren. De nadruk is gelegd op zelfregulatie cognities, uitkomstverwachtingen en tevredenheid na de operatie, emotieverwerking en emotieregulatie, en kwaliteit van leven. Meer inzicht in de factoren die de uitkomst na bariatrische chirurgie beïnvloeden, kan handvatten bieden om de preoperatieve zorg en

indicatiestelling voor operatie te optimaliseren en de postoperatieve zorg, voorlichting en therapie voor patiënten met een hoog risicoprofiel te verbeteren, zodat een beter gewichtsverlies bereikt wordt met minder bijkomende chronische ziekten.

### **Voorspellende waarde van preoperatieve factoren**

Eén van de doelen van dit proefschrift was om de voorspellende waarde van preoperatieve psychologische factoren voor gewichtsverlies na operatie te onderzoeken. Gebaseerd op algemene theorieën uit de Gezondheidspsychologie hadden we verwacht dat er een voorspellende waarde zou zijn voor preoperatieve uitkomstverwachtingen, zelfregulatie cognities en kwaliteit van leven.

Theorieën uit de Gezondheidspsychologie en observaties bij niet-chirurgische behandelingen voor gewichtsverlies wijzen erop dat positieve uitkomstverwachtingen kunnen leiden tot een beslissing om eetgedrag te verbeteren. In ons onderzoek naar preoperatieve verwachtingen bij patiënten die bariatrische chirurgie ondergingen werd deze hypothese echter niet bevestigd (hoofdstuk 5). Er was geen samenhang tussen preoperatieve uitkomstverwachtingen en postoperatieve psychologische uitkomsten of het gewichtsverlies één jaar na operatie. Dit suggereert dat tijdens de fase van gewichtsverlies na bariatrische chirurgie het effect van de operatie op het gewichtsverlies belangrijker is dan het ondersteunende effect van psychologische variabelen.

In ons onderzoek naar zelfregulatie cognities (hoofdstuk 4) vonden we dat na operatie de zelfregulatie cognities weliswaar sterk verbeterd waren en samenhangen met het gewichtsverlies één jaar na operatie, maar er was geen voorspellende waarde voor preoperatieve zelfregulatie cognities op gewichtsverlies na operatie. Voor de operatie weerspiegelden de zelfregulatie cognities van de patiënten bariatrische chirurgie een hulpeloze en pessimistische toestand. Deze conditie wordt ‘aangeleerde hulpeloosheid’ genoemd. Veel mensen met morbide obesitas zullen ervaren hebben dat herhaaldelijke pogingen om af te vallen faalden en dat de situatie onveranderbaar was geworden. Onze resultaten komen overeen met uitkomsten van ander onderzoek naar bariatrische chirurgie, die laten zien dat preoperatieve psychiatrische aandoeningen, persoonlijkheidskenmerken en preoperatief binge eating (eetbuienstoornis) geen voorspellende waarden hebben voor postoperatief gewichtsverlies. Onze patiënten met morbide obesitas verschilden van mensen met overgewicht die een dieetinterventie ondergingen, in de zin dat ze veel zwaarder waren. Wat ook de exacte mechanismen mogen zijn, onze resultaten geven in sterke mate aan dat operatief geïnduceerde effecten van gewichtsverlies na operatie onafhankelijk van de onderzochte preoperatieve zelfregulatie cognities bereikt worden.

Kwaliteit van leven wordt vaak gezien als een secundaire uitkomstmaat van bariatrische chirurgie, maar kan ook als voorspeller voor gezondheidsgedrag beschouwd worden. Onze hypothese, gebaseerd op het 'health belief model', was dat een lagere kwaliteit van leven een dreiging is die vraagt om actie; het is een signaal dat verandering van gezondheidsgedrag nodig maakt, terwijl een goede kwaliteit van leven een signaal is dat er geen verandering nodig is. Conform onze hypothese vonden we een significant prospectieve samenhang tussen een lage mentale kwaliteit van leven en meer gewichtsverlies op de lange termijn (hoofdstuk 6). In ons onderzoek bij patiënten met weinig gewichtsverlies na een maagbandoperatie, die vervolgens wel of geen maagverkleining kregen, vonden we ook dat de groep die wel een maagverkleining kreeg een lagere kwaliteit van leven had dan de groep die deze niet kreeg (hoofdstuk 7). Beide bevindingen zijn in overeenstemming met de verwachting dat een relatief lagere kwaliteit van leven een reden tot actie is. Voor depressieve symptomen hadden we de hypothese dat ze in verband zouden staan met minder gewichtsverlies. Deze hypothese was gebaseerd op het 'limited strength model', waarbij problemen met zelfregulatie op het ene gebied (bijvoorbeeld regulering van negatieve emoties) hulpbronnen op een andere gebied (bijvoorbeeld controleren van eten) verminderen. Volgens emotieregulatiemodellen gaan mensen overeten als sprake is van negatieve emoties. Echter, wij vonden geen bewijs voor dit model als het gaat om depressieve stemming bij patiënten bariatrische chirurgie. Wij vonden zelfs een verband tussen meer preoperatieve depressieve symptomen -wat zal correleren met, maar niet hetzelfde is als depressie- en meer gewichtsverlies op de lange termijn. Depressieve gevoelens hangen sterk samen met een verminderde mentale kwaliteit van leven zoals gemeten met vragenlijsten, wat aangeeft dat ze min of meer dezelfde lijdensdruk vertegenwoordigen. Zoals in andere onderzoeken vonden wij dat een lage kwaliteit van leven en depressieve symptomen geen samenhang vertonen met gewichtsverlies op de korte termijn. Een verklaring voor de samenhang met gewichtsverlies op lange termijn zou kunnen zijn dat mensen die zich ongelukkig voelen meer aanvullende hulp zoeken om het gewenste gewichtsverlies te bereiken en meer aandacht krijgen van het bariatrisch-chirurgisch team.

De slechts beperkt voorspellende waarde van psychologische factoren ten aanzien van gewichtsverlies na bariatrische chirurgie geeft aan dat algemene theorieën uit de Gezondheidspsychologie niet automatisch gelden voor patiënten bariatrische chirurgie. In dit opzicht verschillen patiënten bariatrische chirurgie van andere patiënten met overgewicht. Dat operatief bereikte effecten van gewichtsverlies na bariatrische chirurgie onafhankelijk zijn van preoperatieve uitkomstverwachtingen en zelfregulatie cognities, betekent dat preoperatieve psychologische variabelen niet gebruikt kunnen worden om aan te duiden wie wel en wie niet een goede gewichtsuitkomst zal bereiken. Deze variabelen

kunnen dus niet gebruikt worden om voorafgaand aan de operatie te bepalen wie postoperatief meer aandacht nodig zal hebben of wie wel en niet geselecteerd kunnen worden voor de operatie. Dat patiënten met een lagere mentale kwaliteit van leven of depressieve symptomen vóór operatie een beter lange termijn gewichtverlies bereiken laat mogelijk zien dat patiënten met een goede mentale kwaliteit van leven na operatie soms aan de aandacht van het team bariatrische chirurgie ontsnappen. Daar bariatrische chirurgie nodig is om bij deze ernstig obese groep gewichtsverlies te bereiken en de invloed van preoperatieve psychologische verschillen op gewichtverlies na operatie gering is, is de operatie noodzakelijk om te ontdekken wie wel en wie niet een goed gewichtsverlies zal bereiken.

### **Voorspellende waarde van postoperatieve factoren**

Een andere doel van dit proefschrift was het onderzoeken van de voorspellende waarde van psychologische factoren één jaar na operatie op het gewichtsverlies op de lange termijn.

Algemene theorieën uit de Gezondheidspsychologie leiden tot min of meer tegenstrijdige voorspellingen. Zowel tevredenheid met de uitkomst na operatie als een lagere kwaliteit van leven zouden voorspellers kunnen zijn voor meer gewichtsverlies op de lange termijn. Het initiatief nemen tot gedragsverandering en het behoud van gedragsverandering worden verondersteld gebaseerd te zijn op twee verschillende processen van besluitvorming. Positieve verwachtingen van gedragsverandering worden verondersteld nieuw gedrag te initiëren, terwijl tevredenheid met de uitkomst invloed heeft op het besluit om gezondheidsgedrag te handhaven. Het tweede deel van de theorie is gebaseerd op de aanname dat mensen streven naar behoud van tevredenheid.

Onze hypothese dat tevredenheid met de uitkomst één jaar na operatie in verband zou staan met gewichtsbehoud op de lange termijn werd niet bevestigd in ons onderzoek (hoofdstuk 5). Onze resultaten laten zien dat tevredenheid met de uitkomst van de operatie samenhang met gewichtsverlies na één jaar, maar niet met gewichtsbehoud op lange termijn. Deze bevindingen lijken erop te wijzen dat tevredenheid met de uitkomst van de operatie een gevolg is van gewichtsverlies, meer dan gewichtsbehoud op de lange termijn een gevolg is van tevredenheid.

Vanuit het health belief model kan min of meer het omgekeerde verwacht worden. Onze definitie van tevredenheid komt dicht in de buurt van de component ‘waargenomen gezondheidsvoordeel’ in dit model. Volgens dit model zijn de ‘ervaren dreiging van een ziekte’ en het ‘waargenomen gezondheidsvoordeel versus gezondheidsnadeel van gedragsverandering’ bepalend voor het al dan niet overgaan tot gezonder gedrag. In onze onderzoeken naar kwaliteit van leven (hoofdstuk 6 en 7) hebben we de nadruk gelegd op

de component 'ervaren dreiging van een ziekte' en verondersteld dat een lagere kwaliteit van leven één jaar na operatie een factor is die motiveert tot actie om meer gewichtsverlies te bereiken. Er was inderdaad een samenhang tussen een lagere kwaliteit van leven één jaar na de operatie en meer gewichtsverlies op de lange termijn (hoofdstuk 6). Verder bleek uit ons onderzoek naar patiënten met weinig gewichtsverlies na een maagbandoperatie, die vervolgens wel of geen maagverkleining kregen, dat de groep die wel een maagverkleining kreeg een lagere kwaliteit van leven had dan de groep die deze niet kreeg (hoofdstuk 7). Opgemerkt dient te worden dat we significante verbanden vonden voor mentale kwaliteit van leven, maar niet voor fysiek of sociaal functioneren. Dit kan er op wijzen dat vooral de geestelijke gesteldheid van patiënten bepalend is voor de keuze om aanvullende chirurgische behandeling te zoeken en, als die wordt aangeboden, te kiezen voor maagverkleining. Een andere hypothese is dat patiënten met een relatief goede psychische toestand niet kiezen voor een maagverkleining, omdat ze geloven dat ze nog steeds in staat zijn om voedselinname te beperken met hulp van de maagband. Naast de beslissing van de patiënt, speelt ook de beslissing van de chirurg een rol. De observatie dat patiënten met een relatief hoge mentale kwaliteit van leven niet vragen om een aanvullende interventie, suggereert dat een relatief hoge mentale kwaliteit van leven een risicofactor is voor minder lange-termijngewichtsverlies en dus meer bijbehorende chronische ziekten. Het bariatrisch-chirurgische team zou zich bewust moeten zijn dat een hoge mentale kwaliteit van leven een goede gewichtsuitkomst na bariatrische chirurgie in de weg kan staan.

Deze slechts gedeeltelijk bevestigde voorspellende waarde van postoperatieve psychologische variabelen ondersteunt het idee dat algemene theorieën uit de Gezondheidspsychologie niet automatisch gelden voor bariatrische chirurgie patiënten. Onze resultaten laten zien dat morbide obese patiënten verschillen van patiënten met overgewicht die een niet-chirurgische behandeling ondergaan. De implicatie van onze onderzoeken is dat alleen een lage mentale kwaliteit van leven en depressieve symptomen na operatie een voorspellende waarde hebben voor het gewichtsverlies op de lange termijn bij bariatrische chirurgie patiënten met morbide obesitas.

### **Verwerking en regulatie van emoties**

Er is nog nauwelijks onderzoek gedaan naar de rol van emoties bij het ontstaan en in stand houden van overgewicht en obesitas. In onze kwalitatieve studie van patiënten met een niet-succesvolle uitkomst na bariatrische chirurgie (hoofdstuk 2) hebben we waargenomen dat deelnemers vaak als reden voor hun gewichtstoename verwezen naar een periode van emotionele tegenslag, die gepaard ging met angst, depressie en zich geïsoleerd voelen. Stressvolle gebeurtenissen in hun leven en psychische problemen bevorderden ongezond

eten. Overeten was hun gebruikelijke manier om met moeilijke emoties om te gaan. Uit ons kwalitatieve onderzoek bleek ook dat obesitas de bron van negatieve emoties kan zijn. Veel patiënten voelden zich gestigmatiseerd en gediscrimineerd door hun zwaarlijvigheid, wat leidde tot negatieve emoties die vervolgens een reden waren om te gaan overeten. Ook in eerder onderzoek is bij mensen met obesitas en morbide obesitas een verband aangetoond met emotioneel eten, de tendens om te eten als er negatieve gevoelens worden ervaren. Emotioneel eten geeft mogelijk aan dat algemene manieren om emoties te verwerken en te reguleren zijn verstoord, zoals is geobserveerd in een aantal eerdere onderzoeken. Ons onderzoek naar emoties (hoofdstuk 3) was het eerste dat de mate van verstoring in emoties en de verwerking en regulatie van emoties bij vrouwen met morbide obesitas heeft gekwantificeerd. Verwerking van emoties verwijst naar redelijk stabiele, onbewuste manieren die het type en de sterkte van een emotionele ervaring weergeven, terwijl emotieregulatie verwijst naar meer bewuste manieren om met emoties om te gaan. Vrouwelijke patiënten met morbide obesitas hadden vóór de operatie minder positieve en meer negatieve emoties, meer moeite met het identificeren van gevoelens en ze onderdrukten emoties vaker dan vrouwen uit de algemene bevolking. De vrouwen met morbide obesitas voelden zich dus emotioneel minder goed en hadden een ongezondere manier van verwerken en regulatie van emoties. Een slechtere emotionele toestand en een ongezondere manier van emotie verwerken hingen samen met emotioneel eten. Deze correlatieve resultaten ondersteunen het vermoeden dat ongezonde emotieverwerking en emotieregulatie mogelijk een rol spelen bij morbide obesitas. Dit wijst op de mogelijke relevantie van emotieverwerking en emotieregulatie als initiërende en in stand houdende mechanismen bij morbide obesitas. Verder onderzoek naar de rol van verwerking en regulatie van emoties als voorspeller van gewichtsuitkomst na bariatrische chirurgie is gewenst. Als de rol van emotieverwerking en emotieregulatie in het postoperatieve interval belangrijk blijkt te zijn, biedt dit nieuwe mogelijkheden om patiënten met morbide obesitas na bariatrische chirurgie te helpen.

### **Conclusie en klinische implicaties**

De studies in dit proefschrift onderzochten cognitieve en emotionele factoren die een goede gewichtsuitkomst na bariatrische chirurgie bevorderen of belemmeren. Vrijwel alle variabelen, inclusief de psychologische, laten vóór operatie een veel slechtere toestand zien dan ná operatie. Dit wijst erop dat na bariatrische chirurgie niet alleen het gewicht en bijbehorende chronische ziekten verminderen, maar ook er ook een verbetering optreedt van het algemeen functioneren, de kwaliteit van leven en de cognities.

Een uitgangspunt van dit proefschrift was dat handvatten om de gewichtsuitkomst van bariatrische chirurgie te verbeteren gevonden konden worden door het bestuderen van cognities en emotionele factoren die eetgedrag van de patiënten beïnvloeden. De psychologische aspecten, zelfregulatie cognities, uitkomstverwachtingen en tevredenheid met de operatie blijken echter geen voorspellers voor de korte en lange termijn gewichtsuitkomsten na bariatrische chirurgie, terwijl ze dat wel zijn bij patiënten met overgewicht en obesitas die een niet-operatieve behandeling ondergaan. De enige voorspeller voor meer gewichtsverlies op de lange termijn na bariatrische chirurgie is een lage mentale kwaliteit van leven. Patiënten met een lagere mentale kwaliteit van leven vóór operatie en één jaar na operatie (= korte termijn) hadden meer gewichtsverlies op de lange termijn.

De eerste implicatie uit het onderzoek van dit proefschrift is dat algemene psychologische theorieën uit de Gezondheidspsychologie niet automatisch gelden voor patiënten bariatrische chirurgie. Morbide obese mensen die zich aanmelden voor bariatrische chirurgie en de operatie ondergaan, verschillen duidelijk van mensen met overgewicht die een niet-operatieve behandeling krijgen. Dat het gewichtsverlies na bariatrische chirurgie onafhankelijk is van preoperatieve zelfregulatie cognities, uitkomstverwachtingen en tevredenheid met de operatie, impliceert dat preoperatieve psychologische variabelen niet gebruikt kunnen worden als criterium om te voorspellen welke patiënten veel gewichtsverlies zullen bereiken dan wel aanvullende zorg, voorlichting of therapie nodig zullen hebben. De tweede implicatie is dat patiënten met een betere mentale kwaliteit van leven vóór en ná operatie het risico lopen minder gewichtsverlies op de lange termijn te bereiken. Het bariatrisch-chirurgisch team zou zich bewust moeten zijn dat het bereiken van gewichtsverlies en gewichtstabilisatie juist voor de patiënten met een betere mentale kwaliteit van leven wat moeilijker kan zijn en dat ook deze patiënten voldoende begeleiding en aandacht nodig hebben.

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Na zes en half jaar parttime werken aan dit proefschrift, eerst naast mijn parttime baan als diëtist in het ziekenhuis in Hengelo en later als docent psychologie aan de Hogeschool van Amsterdam, is het nu af! Het zou echter nooit tot stand zijn gekomen zonder de geweldige begeleiding, hulp en steun van velen. Daarom wil ik graag een aantal mensen bedanken.

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Hanna

Leiden, september 2011



# **Curriculum Vitae**

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## **English**

Hanna (Johanna Wilhelmina) Zijlstra was born May 1, 1963 in Amsterdam. She obtained a Master's degree in Clinical Psychology and Health Psychology at Utrecht University in 2003 and a Bachelor's degree in Nutrition and Dietetics at the University of Applied Sciences of Arnhem/Nijmegen in 1988. After working many years as a dietician and manager in a hospital, she is from 2006 employed as a lecturer at the department of Nutrition and Dietetics of the University of Applied Sciences Amsterdam. She is teaching psychology, diet counseling, communication, health promotion, research and statistics, and she is coordinator of the Excellent students program. Part of her teaching consists of the supervision of graduation theses. Since its foundation in 2009, she participates and conducts research in the Chair 'Weight management' of the department of Nutrition and Dietetics of the University of Applied Sciences in Amsterdam. In clinical practice she coaches persons with persistent overweight, eating problems, and eating disorders.

After graduation in Clinical Psychology and Health Psychology, she was involved in research on the development and validation of the Dutch version of the 'Linguistic Inquiry and Word Count' (LIWC), a computerized program for analysis of the psychological content of texts.

From 2005 she has been working part-time on her Ph.D. project on cognitive and emotional processes that could promote and obstruct a successful outcome after bariatric surgery for morbid obesity. The project is conducted in close collaboration with the St. Antonius Hospital Nieuwegein, and from 2008 with the department of Nutrition and Dietetics of the University of Applied Sciences in Amsterdam.

## **Nederlands (Dutch)**

Hanna (Johanna Wilhelmina) Zijlstra is op 1 mei 1963 in Amsterdam geboren. In 2003 heeft zij haar doctoraal in de Klinische Psychologie and Gezondheidspsychologie aan de Universiteit Utrecht behaald en in 1988 rondde zij de Opleiding Voeding en Diëtetiek af aan de Hogeschool Arnhem/Nijmegen. Na vele jaren als diëtist en leidinggevende in een ziekenhuis gewerkt te hebben, is ze sinds 2006 werkzaam als docent bij de Opleiding Voeding en Diëtetiek van de Hogeschool van Amsterdam. Ze geeft les in de vakken psychologie, dieetadvisering en -begeleiding, communicatie, voorlichtingskunde, onderzoek en statistiek, en zij is coördinator van het programma voor excellente studenten. Een deel van haar onderwijstaak bestaat uit het begeleiden van afstudeerscripties. Sinds de oprichting in 2009, is zij deelnemer en onderzoeker van de kenniskring van het lectoraat "Gewichtsmanagement" van de Opleiding Voeding en Diëtetiek van de Hogeschool van

Amsterdam. In een eigen praktijk begeleidt ze mensen met hardnekkig overgewicht, eetproblemen en eetstoornissen.

Na haar doctoraal in de Klinische Psychologie en Gezondheidspsychologie heeft zij onderzoek gedaan naar de ontwikkeling en validatie van de Nederlandse versie van de 'Linguistic Inquiry and Word Count' (LIWC), een computerprogramma voor analyse en de psychologische betekenis van teksten.

Sinds 2005 heeft zij parttime gewerkt aan haar promotieonderzoek naar cognitieve en emotionele processen die een succesvolle uitkomst na bariatrische chirurgie voor morbide obesitas kunnen bevorderen en belemmeren. Het onderzoek is uitgevoerd in nauwe samenwerking met het St. Antonius Ziekenhuis in Nieuwegein en sinds 2008 met de opleiding Voeding en Diëtetiek van de Hogeschool van Amsterdam.



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