PSYCHOSOCIAL PRESENTATION OF REVISIONAL AND PRIMARY BARIATRIC SURGERY PATIENTS

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BA (Hlth & Sci) Hons (Soc Sci) MPsych (Ed & Dev)

Submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

School of Psychology and Counselling

Faculty of Health

Queensland University of Technology

2016

Keywords

Bariatric surgery; revisional bariatric surgery; laparoscopic adjustable gastric banding; laparoscopic gastric sleeve; emotional eating; taste changes

Abstract

The prevalence of obesity has reached epidemic proportions worldwide and is associated with an increased risk of mortality and morbidity, and significant medical and psychosocial consequences. Obesity is a multifaceted disease and requires targeted intervention across numerous domains. Most interventions for obesity have had modest outcomes but have not been sustainable over time. Bariatric surgery, also known as weight loss surgery, is currently the most viable and cost-effective treatment for obesity and shows promising sustainability. However, a significant percentage of patients do not achieve the minimum expectations for weight loss as defined by excess weight loss (EWL), and elect to undergo a revisional surgical procedure or multiple revisional procedures. Inadequate EWL and / or failure to maintain EWL are the most common indicators for revisional and multiple revisional bariatric surgery. Little is known about the underlying psychosocial causes of bariatric surgery failure, in particular, the influence of patients' psychosocial factors that may predict inadequate EWL post-bariatric surgery. Therefore, this study will redress that paucity through its focus on psychosocial factors.

The initial phase of this research project aimed to identify the psychosocial factors that discriminate between two sub-populations of obese patients presenting for revisional bariatric surgeries in Queensland, in particular patients who seek Laparoscopic Adjustable Gastric Band (LAGB) surgery (a specific form of bariatric surgery). These sub-populations were patients who required an initial revisional bariatric surgery in order to achieve EWL (study 1), and patients who did not achieve EWL following initial or subsequent revisional surgeries, prompting them to seek multiple revisional surgeries (study 2). Examining the potential psychosocial causes of an unsuccessful outcome in patients who have had multiple revisional weight loss surgeries was deemed important, as it may identify unique psychosocial factors, combinations of factors, or intensity of factors not previously considered in explanatory theories and, thus, provide insight into the unsatisfactory outcome in this population. Studies 1 and 2 utilised grounded theory to build unique models to provide explanations for EWL failure for these two sub-populations. In Study 1 following the grounded theory analysis of the 23 interviews, a model emerged with

core category of unrealistic expectations of LAGB and five conceptual categories: restriction of band, impacts on social interactions, desire for food choices that give reward, increase in consumption of high calorie dense food choices because of texture and reward, and shame, loneliness and loss. In Study 2, Participants reported 12 key factors that represented their experiences of revisional bariatric surgery. A model emerged grounded in the data, with the core category of unrealistic expectations of weight loss surgery and 11 conceptual categories: interpersonal trauma; unattractive body image as a protection against further emotional and sexual abuse; mental health difficulties; negative affect (shame and loneliness); failure of past surgeries; lack of social support; desire for reward from food; revisional weight loss surgery; change in taste; gap between anticipated and actual experience of reward from food; over eating/uncontrolled eating and perceived unsatisfactory outcome. The initial phase of the research involved an inductive approach to develop unique models and the secondary phase employed a deductive approach to test the capacity of these models to accurately predict post-bariatric surgery weight loss outcomes at 6 months for a new cohort of patients having a primary procedure (study 3).

The secondary phase of the research offered a quantitative explanation for differences in the early weight loss trajectory of patients electing to have a primary Laparoscopic Sleeve Gastrectomy (LSG). In Study 3, the initial bivariate correlations with weight loss outcome at 6 months post-LSG and the constructs of locus of control, physical activity, mental health and perceived social support did not reach statistical significance. In the initial bivariate correlations with percentage excess weight loss outcome (% EWL) and changes in the perception of Taste, Desire and Enjoyment of flavours at 6 months post-LSG, changes in savoury desire reached statistical significance. Therefore, Study 3a, a longitudinal study investigated the physiological patient-reported factors; satisfaction with eating behaviour and the change in taste perception, as well as desire, and enjoyment of flavours in relation to post-surgery weight loss in a primary LSG cohort. The results confirmed that patient-reported outcomes identified in the prior qualitative studies such as subjective changes in taste, desire, and enjoyment of flavours of the eight taste modalities are very common after primary LSG and may have important implications on food preferences and satisfaction with eating behaviours post-surgery. Further, the

perception of taste and desire of flavours post-surgery are related to quality of alimentation. Findings from grounded theory models developed in Studies 1 and 2 identified multi factorial eating behaviours that were not disordered in nature, but that may be associated with a range of negative eating-related choices post-operatively in bariatric surgery patients. In the initial bivariate correlations with percentage total weight loss (% TWL) at 6 months post-LSG, lack of control, relief from negative states, thoughts and emotional eating reached statistical significance. Further, emotional eating and ≤ 40 % EWL reached statistical significance. Thus, these psychological eating- related factors were examined in Study 3b. The findings of the secondary phase, augments current empirical research by identifying negative emotional eating as a response to food cravings as a risk factor for early lower weight loss outcomes in primary Laparoscopic Sleeve Gastrectomy (LSG) patients. Identifying and elucidating these unreported factors contributes to the understanding of the psychosocial determinates of not achieving a satisfactory weight loss outcome post-bariatric surgery in that it highlights the significant transitions and challenges that bariatric surgery patients experience with regards to their changing relationship with food and their individual circumstances. Further, these findings highlight that the psychosocial factors leading to an unsatisfactory weight loss outcome are multifactorial and complex and may be exacerbated or instigated by the time period after surgery and the type of bariatric surgery.

The findings of this thesis assist in understanding the factors that have contributed to revisional (study 1) and multiple revisional (study 2) bariatric patients not achieving an expected weight loss outcome post-primary LAGB, how patients who have undergone bariatric surgery perceive and describe the factors that contributed to seeking revisional (study 1) and multiple revisional (study 2) bariatric surgery and what psychosocial factors (study 3) predict the early weight loss trajectory in primary bariatric patients. The unique findings of this program of research will assist medical professionals, allied health professionals, bariatric surgery patients, their families and the broader community by improving the understanding of patients' experiences of undergoing revisional surgery or multiple revisional surgeries, identifying at-risk patients and providing clinical recommendations.

Publications in Thesis

Janse Van Vuuren, M., Strodl, E., White, K.M., & Lockie, P. (2015). Psychosocial presentation of revisional LAGB patients: A qualitative study. *Journal of Clinical Obesity*, VOL, **5**(5): 273-280. doi: 10.1111/cob.12113

This manuscript has been published in the *Journal of Clinical Obesity.*

Janse Van Vuuren, M., Strodl, E., White, K. M., & Lockie, P. (Accepted). Psychosocial presentation of female bariatric surgery patients after multiple revisional surgeries. *Journal of Health Psychology*. doi:10.1177/1359105316648673

This manuscript has been published online before print in the *Journal of Health Psychology*

Janse Van Vuuren, M., Strodl, E., White, K.M., & Lockie, P. (under review). Change in taste, enjoyment, desire and eating satisfaction after laparoscopic sleeve gastrectomy - short term results.

This manuscript is under review in *Obesity Surgery*

Janse Van Vuuren, M., Strodl, E., White, K.M., & Lockie, P. (under review). Short term results of Sleeve Gastrectomy: Eating behaviours. *Surgery for Obesity and Related Diseases.*

This manuscript is under review for publication

Conference and Workshop Presentations

Janse Van Vuuren, M. (2016*). Psychosocial presentation of bariatric surgery patients.* Holy Spirit Brisbane Hospital Grapevine Symposium

Janse Van Vuuren, M. (2016). *Psychosocial presentation of bariatric surgery patients.* Annual Scientific Congress, Royal Australian College of Surgeons

Janse Van Vuuren, M, Strodl, E., White, K.M., & Lockie. P. (2015). *Psychosocial Presentation of Revisional LAGB Patients: A Qualitative Study*. Paper presented at Combined ANZGOSA - OSSANZ 27th Annual Scientific Meeting, Hamilton Island, Australia.

Janse Van Vuuren, M., Strodl, E., White, K.M., & Lockie, P. (2015). *Psychosocial Presentation of Multiple Revisional LAGB Patients: A Qualitative Study.* Paper presented at Combined ANZGOSA – OSSANZ 27th Annual Scientific Meeting, Hamilton Island, Australia.

Janse Van Vuuren, M. (2015). *Psychological challenges in primary and revisional LAGB patients an integrated approach.* Expert panel and Presentation - Dieticians Workshop Combined ANZGOSA – OSSANZ 27th Annual Scientific Meeting, Hamilton Island, Australia

Janse Van Vuuren, M. (2015). *Psychological challenges of Primary and Revisional Bariatric patients on the ward.* Expert panel and Presentation - Nurses Workshop Combined ANZGOSA – OSSANZ 27th Annual Scientific Meeting, Hamilton Island, Australia

Janse Van Vuuren, M. (2015). *Psychosocial Presentation of Revisional Bariatric Surgery Patients.* Queensland University of Technology Symposium.

Janse Van Vuuren, M. (2014). *Psychosocial Presentation of Bariatric Surgery Patients.* Qld Health Public forum.

Janse Van Vuuren, M. (2014). *Psychosocial Presentation of Bariatric Surgery Patients.* Nurse Practitioners (PNAQ) Workshop.

Janse Van Vuuren, M. (2014). *Psychosocial Presentation of Bariatric Surgery Patients.* Holy Spirit Brisbane Hospital Grapevine Symposium.

Janse Van Vuuren, M. (2013). *Weight maintenance challenges post-bariatric Surgery.* Dieticians Association of Australia Roadshow.

Janse Van Vuuren, M. (2013). *Psychosocial presentation of Revisional Bariatric Surgery Patients.* Queensland University of Technology Symposium.

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List of Abbreviations

APA – American Psychological Association

ABS – Australian Bureau of Statistics

BMI – Median Body Mass Index

BPD – Biliopancreatic Diversion

EWL – Excess Weight Loss

% EWL – % Excess Weight Loss

GERD – Gastroesophageal Reflux Disease

HRQL – Health Related Quality of Life

LAGB – Laparoscopic Adjustable Gastric Band

LOC – Loss of Control

LSG – Laparoscopic Sleeve Gastrectomy

LGP – Laparoscopic Gastric Plication

NES – Night Eating Syndrome

QOL – Quality of Life

ReSG – Revised Sleeve Gastrectomy

RYGBP – Roux-en-Y Gastric Bypass

SPSS – Statistical Package for Social Scientists

% TWL – % Total Weight Loss

WHO – World Health Organization

Glossary of Technical Terms

Bariatric Surgery

Bariatric surgery, or weight-loss surgery does not refer to one specific surgical procedure, but rather to a variety of surgical procedures that aim to treat obesity by changing the gastrointestinal tract (stomach and digestive system) to reduce calorie intake and/or reduce absorption. The most common types of bariatric surgery include: Roux-en-Y Gastric Bypass (RYGB), Laparoscopic Adjustable Banding (LAGB) and the Laparoscopic Sleeve Gastrectomy (LSG).

Excess Weight Loss (EWL)

Excess loss of weight refers to the loss of weight required to achieve a BMI of 25kg/m^2. EWL is calculated as the difference between the calculated weight that would result in a BMI of 25kg/m^2 and weight at the time of bariatric surgery.

% Excess Weight Loss (% EWL)

% EWL is a commonly used a marker of weight loss success (EWL>-50%).

% EWL is calculated using the following formula: (post-operative weight loss)/ (pre operative excess weight) x 100. BMI ≥ 25kg/m^2 is recognised as the lowest limit of overweight, and therefore excess weight is calculated relative to a BMI of 25kg/m^2

Health Related Quality of Life (HRQL)

Health related quality of life refers to the impact of health or medical conditions on general life functioning and includes physical activity and its limitations, physical functioning, pain, vitality, social life, mental health, and limitations due to person's psychological state (Fontaine & Barofsky, 2001).

Laparoscopic Adjustable Gastric Band (LAGB)

A reversible gastric restrictive surgical procedure wherein an adjustable gastric band is placed around the top part of the stomach. This effectively create a small stomach pouch. The restriction is controlled by the internal diameter of the band, which can be adjusted by adding saline to a reservoir, which sits under the skin. Adjustments to the adjustable gastric band are done by trained medical professionals.

Laparoscopic Sleeve Gastrectomy (LSG)

Laparoscopic sleeve gastrectomy is also referred to as a vertical sleeve gastrectomy or a tube gastrectomy, wherein approximately 70 – 80% of the stomach is removed and effectively turning the stomach, into a long tube. There is no major alteration in the gastro-intestinal tract and is thus not a malabsorptive procedure.

Laparoscopic Gastric Plication (LGP)

Laparoscopic gastric plication is relatively new procedure that reduces the size of the stomach and does not involve the use of any foreign device such as is used for the LAGB.

Median Body Mass Index (BMI)

Median body mass index is a key index for linking body weight to height. BMI is calculated by dividing a person's weight in kilograms (kg) by their height in metres squared (m^2) (Kruseman, Leimgruber, Zumbach, & Golay, 2010).

Night Eating Syndrome (NES)

Night eating syndrome describes a pattern of behaviours characterised by waking at night to eat, or when food consumption occurs disproportionately later in the day (Allison et al., 2008).

Psychosocial

Relating to the interrelation of social factors and individual thought, behaviour, and mental health (Mamplekou, Komesidou, Bissias, Papakonstantinou, & Melissas, 2005).

Quality of Life (QOL)

Quality of life relates to an individual's experience of satisfaction and happiness related to physical, psychological, emotional, social, and spiritual aspects of life (Livingston & Fink, 2003).

Roux-en-Y Gastric Bypass (RYGBP)

A malabsorptive/restrictive surgical procedure where a section of the digestive tract is removed or bypassed limiting the calories absorbed from food and physically restricting the size of the stomach and slowing down digestion.

% Total Weight Loss (%TWL)

% Total weight loss refers to the total weight loss post-bariatric surgery and is calculated by subtracting the weight in kilograms at the surgery date from the postoperative weight at 6 months post-surgery. %TWL is calculated with the following formula: (pre-operative weight) - (post-operative weight)/(pre-operative weight) x 100.

Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

QUT Verified Signature

Signature:

Date: 16/09/2016

Acknowledgements

First and foremost, I wish to extend my sincere and heartfelt thanks to my research supervisors, Esben Strodl, Katy White, and Philip Lockie who together have provided a wealth of insight and expertise. Esben, I am eternally grateful for your expertise, patient guidance and wisdom throughout my candidature. Your interest and unwavering support is sincerely appreciated. Katy, your enthusiastic encouragement, valued and useful critiques have been immensely appreciated. Phil, your support and encouragement to embark on this journey has been greatly valued. I wish to sincerely thank the participants of all three studies who courageously shared their experiences with me and took the time to partake in the interviews and complete the questionnaires. I would like to express my gratitude to all my professional colleagues for their encouragement, ongoing discussions and deliberations throughout my candidature. Finally, I wish to sincerely thank my family for encouraging me, endlessly supporting my dream, and unselfishly sharing this journey with me.

Chapter 1: Introduction

Obesity has been regarded an escalating, global epidemic by the World Health Organization with worldwide rates of obesity more than doubling since 1980 (WHO, 2015). In 2014 more than 1.9 billion adults, 18 years and older, were overweight and more than half a billion people were obese (WHO, 2015). Similarly, the prevalence of overweight and obesity among Australians has been steadily increasing for the past 30 years. Approximately 60% of the Australian population were classified as overweight in 2011–12, and more than 25% of these fell into the obese category (ABS, 2012). If weight gain continues to rise at current levels, by 2025, close to 80% of all Australian adults will be overweight or obese (ABS, 2012). The World Health Organization (WHO) estimates that around 3.4 million adults die each year as a result of overweight or obesity (WHO, 2015). Morbid obesity is presently identified as the leading cause of premature and preventable death in Australia (ABS, 2012).

In 2013 the American Medical Association (AMA) at its Annual Meeting agreed that Obesity should be declared a disease (Mechanick et al., 2013). Obesity is a multifactorial disease of complex etiological origin, related to multiple interacting genetic and environmental factors (Skender et al., 1996). For the many people struggling with obesity, lifestyle interventions such as dieting, increased exercise, and pharmacology have been effective for weight loss in the short term but these interventions have not been successful in the long-term or helpful for maintaining the weight lost. Bariatric surgery is currently the most effective and durable intervention for weight loss in patients suffering with obesity and morbid obesity and its incidence has increased exponentially worldwide (O'Brien, MacDonald, Anderson, Brennan, & Brown, 2013b). In Australia, the incidence of bariatric surgeries has also increased, with approximately 500 bariatric surgeries performed in 1998–99 increasing to 17,000 in 2007–08. Bariatric surgery is the most rapidly growing area of all surgical practices in Australia today (AIHW, 2010; O'Brien, Dixon, & Brown, 2004). Bariatric or weight loss surgery includes procedures such as laparoscopic adjustable gastric band, laparoscopic gastric sleeve, and Roux-en-y gastric bypass. Bariatric surgery has been demonstrated to be an effective way to reduce body weight, and does result in an improvement in a number of comorbidities. However,

some bariatric patients struggle to make the recommended lifestyle and eating behavioural changes after weight loss surgery and there is a tendency that for those who do make changes, the changes decrease with time and this often results in weight regain (Kalarchian et al., 2008; Odom et al., 2010). Consequently, 30%-50% of patients do not achieve sufficient weight loss, or experience weight loss followed by weight regain and so go on to have revisional and multiple revisional bariatric surgeries in order to achieve the excess weight loss outcome (DeMaria et al., 2001; Suter, Calmes, Paroz, & Giusti, 2006).

The purpose of this chapter is to present the context (section 1.1) of the research program by describing the current surgical options for treating obesity which sets the scene for delineating the specific purposes of this research (section 1.2). Section 1.2 describes the significance and scope of this research. Finally, section 1.3 includes an outline of the remaining chapters of the thesis and their contribution to the overall program of research.

1.1 CONTEXT: SURGICAL TREATMENT OPTIONS FOR TREATING OBESITY

In response to the rapidly increasing rates of obesity, many of the traditional psychological and pharmacological interventions have failed to demonstrate sustained long-term weight loss outcomes (Niego, Kofman, Weiss, & Geliebter, 2007). Bariatric surgery offers an alternative intervention, and as indicated earlier, the number of bariatric surgeries performed has increased dramatically in recent years, with over 17,000 bariatric surgery procedures performed in Australia in 2014 compared to less than 50 procedures performed annually before 1970 (Carter, 2015). Bariatric surgery is a cost-effective intervention that generally results in long-term weight loss and a decrease in obesity related morbidity and mortality (Kissane & Pratt, 2011; Padwal et al., 2011). However, while bariatric surgery has been demonstrated to be an effective way to reduce body weight and one that results in an improvement in comorbidities, not all bariatric patients achieve the excess weight loss outcome (EWL) and some patients experience weight regain and go on to have revisional, and in some cases, multiple revisional bariatric surgeries in order to achieve their EWL.

1.2 PURPOSES

As a consequence of the trend of increasing obesity rates worldwide and in Australia, there has been a substantial increase in the number of primary bariatric surgeries, revisional, and multiple revisional procedures being performed to address this global concern. Therefore, this thesis focuses on identifying potential psychosocial causes of weight loss failure in revisional and multiple revisional bariatric surgery patients. Examining the potential psychosocial determinants of an unsuccessful outcome in patients who have had multiple revisional weight loss surgeries may offer insight into these patients' repeated EWL failures. This examination hopes to identify unique psychosocial factors, combinations of factors, or intensity of factors not previously considered in explanatory theories. It is also expected that multiple revisional patients will have unique psychosocial features that distinguish them from primary revisional bariatric surgery patients. Thus, examining and comparing revisional and multiple revisional bariatric surgery patients may, in addition, provide the opportunity to identify unique features of each cohort.

Investigating this issue is important as patients are significantly invested in the decision to have bariatric surgery and view the surgery as a last resort to address their long-term weight difficulties. The current program of research aimed to further the knowledge of long-term, postoperative bariatric surgery outcomes in patients who have had revisional and multiple revisional bariatric surgeries after a failed primary LAGB. Additionally, the aim was to understand and identify the psychosocial factors that may contribute to not achieving an expected weight loss outcome after a primary weight loss procedure. Thus, this thesis has two focal research questions:

1. What do patients who have undergone revisional and multiple revisional bariatric procedures perceive has contributed to them not achieving an expected weight loss outcome post-primary LAGB?
2. What psychosocial factors predict the weight loss trajectory in primary bariatric patients in a longitudinal study?

1.3 SIGNIFICANCE AND SCOPE

As stated previously, the increasing prevalence of obesity has led to an increase in the incidence of bariatric surgery and an increase in the incidence of revisional bariatric surgery for the treatment of obese and severely obese individuals (Herpertz,

Kielmann, Wolf, Hebebrand, & Senf, 2004). However, there is a paucity of research exploring the psychological predictors of success or failure following bariatric surgery. Therefore, Study 1 and 2 were inductive in design and generated a model explaining reasons for inadequate weight loss. Study 3 applied findings from Studies 1 and 2 to test the models from the revisional and multiple revisional groups to identify the psychosocial factors that predict patients' weight loss outcomes following bariatric procedures. All three studies provide evidence-based recommendations for the development of psychosocial interventions to support patients undergoing bariatric surgery. Given the increasing number of individuals undergoing bariatric surgery, and revisional bariatric surgery, it is of utmost importance for prospective patients and professionals working with these patients to develop a greater understanding of the unique challenges of bariatric surgery in terms of patient experience. To date, there are no studies that have comprehensively investigated the experiences of patients undergoing revisional or multiple revisional bariatric surgery procedures from the patients' perspectives.

Surgical complications do occur in bariatric surgery, both in surgery and thereafter, and they are a factor resulting in revisional and multiple revisional procedures after a primary bariatric procedure. However, information on medical complications was not explored in the qualitative studies by the researcher or reported on in the studies as they were deemed outside the scope of this program of research. Although the role of physical activity has been clearly demonstrated in the literature in its importance in losing and maintaining weight loss post-bariatric surgery, this program of research did not explore the role of physical activity as it was not identified by participants in the qualitative studies as a construct contributing to weight loss outcomes. In addition, interpersonal trauma was identified as an important construct in Phase one of the research but was not investigated as a predictor variable in Phase two. Given the sensitive nature of the construct and the online survey design of the study, an investigation of this nature was not deemed appropriate as the online survey design of the study would not facilitate providing suitable support for those participants, who may have become distressed when discussing their history or experience of interpersonal trauma.

1.4 THESIS OUTLINE

The thesis was constructed by publication and, therefore does not follow the traditional monograph structure. In this section the structure of the thesis is presented and a brief explanation of the contents of each chapter is outlined.

1.4.1 Chapter One: Introduction

The aim of this initial chapter was to outline the rationale for the research and to present the background and context of the research program. This chapter illustrates the prevalence and distribution of overweight and obesity in Australia and describes the current surgical options for treating obesity, setting the scene and delineating the specific purposes of this research. A second aim is to outline the structure of the document and to briefly summarise each chapter which is addressed in the following sections.

1.4.2 Chapter Two: Literature review

In Chapter Two a review of the current literature on bariatric surgery patients is provided as well as the factors that that may contribute to, and impact upon, weight loss outcomes. Theories of obesity that are pertinent to bariatric surgery are explored and gaps in the existing knowledge are highlighted. The chapter concludes with the significance of the implications of the chapter.

1.4.3 Chapter Three: Methodology

Both qualitative and quantitative methods were employed in the program of research. In Chapter Three these methods of data collection are described and the chapter includes details of the participants, materials used, and procedures undertaken for data collection for each study. It concludes with a statement regarding the ethical conduct approved and adhered throughout the program of research.

1.4.4 Chapter Four: Study 1

Chapter Four presents the first manuscript in this thesis by publication. The purpose of this study was to identify, from patients' (N = 23) perspectives, what contributed to not achieving EWL from a primary LAGB procedure and led to them seeking revisional surgery. Thus, the first research aim was investigated in this qualitative study. Data were analysed from a grounded theory methodology in order to build a causal model. Analysis of participants' reports identified "Unrealistic

expectations of the LAGB" as the core category and also identified other important conceptual categories. This manuscript has been published in the *Journal of Clinical Obesity*.

1.4.5 Chapter Five: Study 2

The first research aim was examined by the study outlined in the second manuscript, and reported in Chapter Five. The second study in the program of research examined factors that contributed to failure in achieving excess weight loss for participants (N = 17 females) following a primary Laparoscopic adjustable band (LAGB) surgery and which led to subsequent multiple revisional bariatric surgeries. A causal model grounded in the data with the core category of "Unrealistic expectations of bariatric surgery" and with other important conceptual categories was developed. This manuscript has been published online ahead of print with the *Journal of Health Psychology.*

1.4.6 Chapter Six: Introduction to Study 3

The findings of the qualitative Studies 1 and 2 are the foundation for the quantitative study, Study 3. This chapter introduces the quantitative longitudinal Study 3 and provides a rationale for the type of bariatric procedure undergone by the participants. Further, this chapter explicitly justifies the variables that were chosen for Phase 2 were based upon the grounded theory models developed from Phase 1 of the program of research and the literature. This chapter concludes by identifying the statistically significant constructs in relation to expected weight loss outcome at 6 months post-primary LSG.

1.4.7 Chapter Seven: Study 3 a

In order to fulfil the second aim of the research, as outlined in section 1.2, a quantitative study applied findings from Studies 1 and 2 to test the models developed to identify the psychosocial factors that predicted patients' (N = 106) early weight loss trajectories, post-laparoscopic sleeve gastrectomy (LSG). This chapter reported on the physiological patient-reported factors influencing eating behaviour post-primary bariatric surgery. The analysis in this chapter empirically tested findings from study by investigating the change in taste perception, and changes in desire and enjoyment of flavour post-LSG, which may impact upon palatability and food preferences and, thus, result in greater weight loss in the longer-term. This study

indicated that subjective changes in taste, desire and enjoyment of flavours of the eight taste modalities of food are very common after LSG.

This manuscript is currently under review in Obesity Surgery**.**

1.4.8 Chapter Eight: Study 3 b

The final manuscript in the thesis examined the second research aim in the quantitative study, Study 3. Findings from Studies 1 and 2 were applied to test the model/s to identify the psychosocial factors that predicted patients' early weight loss trajectories following primary bariatric procedures. This chapter reported on the psychological factors related to eating behaviours post-primary bariatric surgery. Emotions that may be experienced before or during food cravings or eating were of predictive value for early poorer weight loss outcomes at 6 months post-primary LSG in participants *(N* = 106).

This manuscript is currently under review Surgery for Obesity and Related Diseases.

1.4.9 Chapter Nine: Discussion

In the final chapter of the thesis, results from the studies are integrated and discussed with respect to findings from previous research. Further, this chapter includes the practical implications of the program of research, limitations, and strengths of the approaches taken, and suggestions for future research. The chapter concludes that this thesis adds valuable information that may be useful to clinicians, health care professionals and patients and to direct future research in this field.

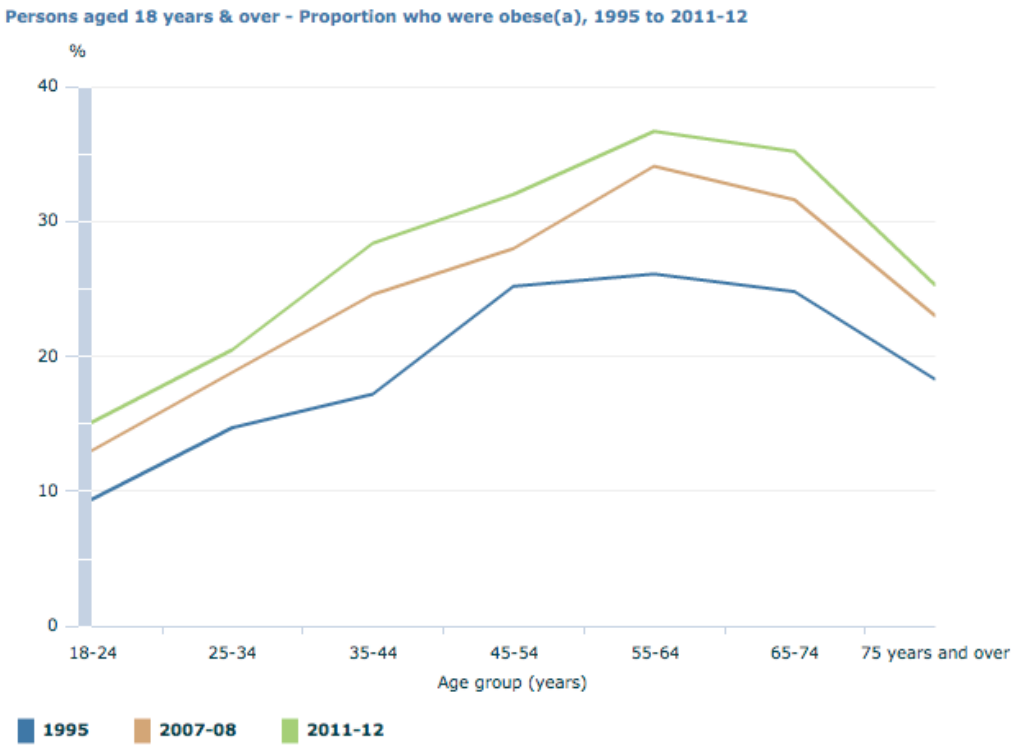
Chapter 2: Literature Review

This chapter begins with a discussion of the epidemiology of obesity in Australia (section 2.1.1), and subsequently reviews literature on the following topics: Physical health consequences of obesity (section 2.1.2); Surgical approaches to treating obesity (2.1.3), in particular, Roux-en Y Gastric Bypass (2.1.4), Laparoscopic Adjustable Gastric Band (2.1.5), Laparoscopic Sleeve Gastrectomy (2.1.6), Laparoscopic Gastric Sleeve Plication (2.1.7), Revisional and multiple revisional bariatric surgery procedures (2.1.8), Measures of success, (2.1.9) Bariatric surgery patient demographics (2.1.10), Patients expectations (2.1.11), Theories of obesity (2.1.12), Psychological profiles of bariatric patients (2.1.13), Interpersonal trauma (2.1.14), Body image dissatisfaction and eating disorders (2.1.15), Eating behaviours post-weight loss surgery (2.1.16), Binge eating behaviours, Night eating syndrome, Grazing, Emotional eating, Food cravings, Taste changes post-bariatric surgery, Social support (2.1.17), Quality of life and health related quality of life (2.1.18) and Revisional bariatric surgery for inadequate weight loss (2.1.19). The chapter concludes in section (2.1.20) with a summary and implications of this chapter.

2.1.1 Epidemiology of obesity

Obesity has reached epidemic proportions both in Australia and internationally. An estimated 1.6 billion adults worldwide are overweight with a body mass index [BMI] between 25.0 and 30.0 kg/m^2) and at least 300 million of these are obese (BMI ≥ 30.0 kg/m2; Queensland Health, 2011). Australia has the fourth highest rate of adult obesity in the world, after the United States, Mexico, and New Zealand (Queensland Health, 2011). In the time frame 2011-12, 62.8% of Australians aged 18 years and over were overweight or obese, comprised of 35.3% overweight and 27.5% obese (ABS, 2012) (see Figure 1 below). Of significant concern is that adult obesity has increased in Australia, from 19% of adults in 1995 to 24% in 2007-2008 and to 27.5% of adults in 2011-12 (ABS, 2012). The rates of overweight and obesity varies according to age, with 74.9% of people aged 65-74 years being regarded as overweight or obese, compared with 36.4% of people aged 18-24 years (ABS, 2012). In 2011-12, a greater percentage of men (69.7%) were overweight or obese

compared to 55.7% of women (ABS, 2012). However, when examining the figures of only those persons who were obese, rates are the same for men and women (both 27.5%) with 22.3% of adult males and 20.3% of adult females classified as obese (ABS, 2012). It is estimated that, by 2025, 37% of Australian adults will be obese and 46% will be overweight (Haby & Markwick, 2008). Correspondingly, obesity is a significant issue in Queensland. Self-reported Queensland obesity figures in 2011 suggest that 34.5% of adult Queenslanders are overweight and 22.9% are obese, and that more than half of the Queensland adult population (57.4%) weigh more than is recommended for good health (Queensland Health, 2011).

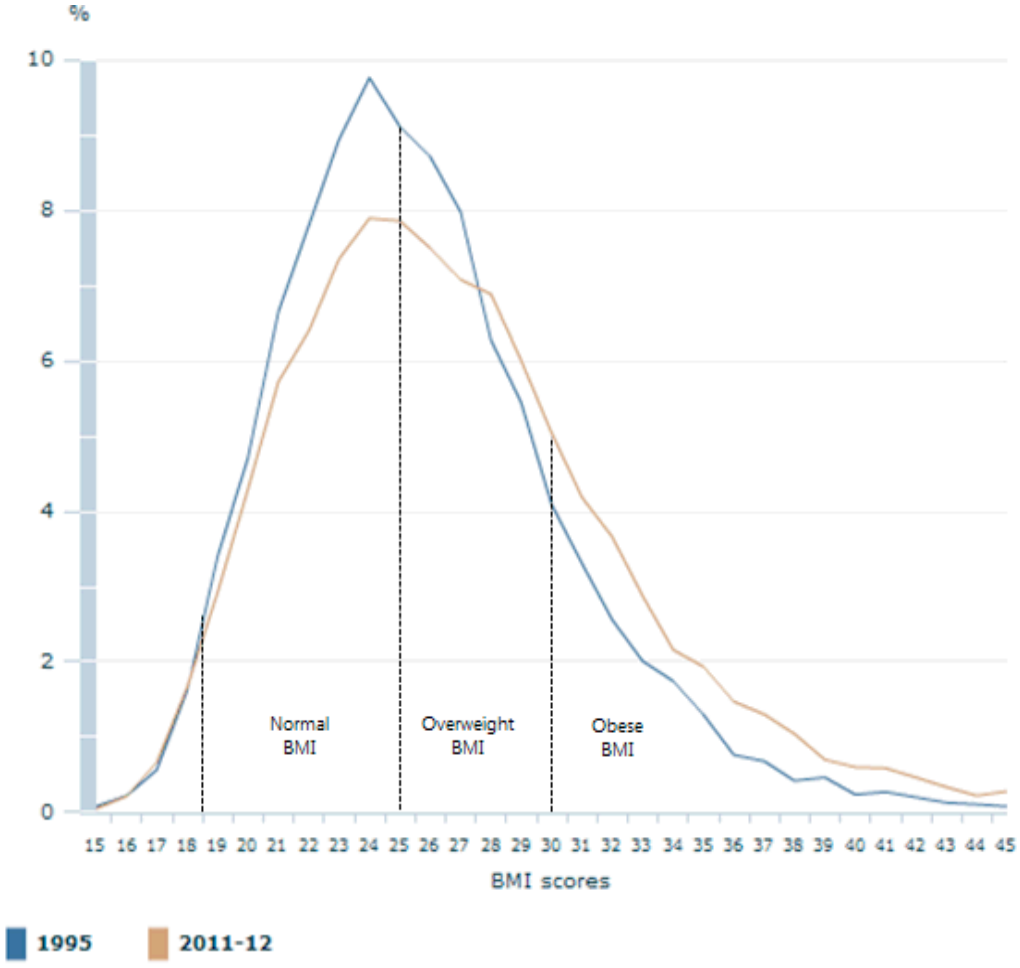


Note. Source: Australian Bureau of Statistics, 2012, Australian Health Survey: First Results, 2011-12

Figure 2.1. Persons aged 18 and over - Proportion who were obese 1995-2011-12

There is an increase in the proportion of people who are overweight or obese and it is propelled by a overall increase in weight and BMI over time (ABS, 2012) (see Figure 2 below). This figure illustrates there is a greater proportion of people who are overweight and obese since 1995, and that there has been an increase in the

proportion of people with a much higher BMI (ABS, 2012). For example, in 1995 only 5.0% of persons aged 18 years and over had a BMI of 35 and over, where as in the timeframe 2011-12 the corresponding proportion was increased to 9.6%. (ABS, 2012).



Footnote(s): *(a) Based on Body Mass Index for persons whose height and weight was measured.*

Source(s): *Australian Health Survey: Updated Results, 2011-12*

Note. Source: Australian Bureau of Statistics, 2012, Australian Health Survey: First Results

Figure 2.2. BMI scores of proportion of people increased over time

Not only is the prevalence of obesity rising in Australia's adult population, there is also a rapid rise in rates of obesity in children and adolescents. This problem presents both immediate and future concerns, as overweight and obese children are more likely to become obese or severe obese adults (Queensland Health, 2011). Globally, it was estimated that at least 20 million children were overweight in 2005

and the prevalence of overweight and obese children in Australia has increased substantially during the past 40 years and is projected to approach adult rates within 30 years (Queensland Health, 2011). In Queensland, rates of overweight or obese children (aged 5-15 years) have increased from 26.1% of in 2007-2008 to 26.5 % in 2009 (Queensland Health, 2011).

2.1.2 Physical health consequences of obesity

The increasing prevalence rate of obesity and extreme obesity is concerning because obesity is a significant risk factor resulting in many health complications. Obesity in Queensland is the leading contributory risk factor for disability and premature death (Queensland Health, 2011). Extreme obesity is associated with significant adverse health outcomes, including metabolic complications such as diabetes mellitus; other dyslipidaemias, elevated triglycerides and cholesterol, increased intra abdominal pressure, which can result in the development of hernias, urinary incontinence, and gastroesophageal reflux, increased risk of a variety of cancers; ischemic heart disease, coronary heart disease, hypertension, stroke, osteoarthritis, and respiratory complications such as sleep apnoea (Haslam & James, 2005; Mitchell & de Zwaan, 2005).

Numerous psychological and psychosocial consequences have been associated with obesity including, anxiety, depression, social discrimination, poor quality of life, low self esteem, and negative body image (Fabricatore et al., 2006; van Hout, Fortuin, Pelle, & van Heck, 2008; Wadden et al., 2007). Within the social domain, individuals with obesity may experience prejudice, discrimination, social isolation, dissatisfying relationships and occupational problems (van Hout, 2005). Further, obesity presents a significant financial cost to society, with the Australian Bureau of Statistics (2008) estimating that obesity and its associated illnesses cost the Australian society and Governments a total of $21 billion in 2005. The increasing prevalence of obesity and its negative consequences has led to an increase in surgery for the treatment of obese and severely obese individuals (Herpertz et al., 2004).

2.1.3 Surgical approaches to treating obesity

Behaviour management and dieting approaches for the treatment of obesity have been proven to be unsuccessful for obesity and extreme obesity which has led to the development of surgical interventions (Bult, van Dalen, & Muller, 2008;

Herpertz et al., 2004). Pharmacotherapy and lifestyle interventions such as reducing calorie intake and exercising typically results in a moderate eight to ten percent loss of initial body weight for people struggling with obesity (Wadden et al., 2001). However, the incidences of weight regain after termination of these behavioural and pharmacological treatments are often significant and the majority of patients are unable to maintain the weight loss for longer than one year and therefore many return to their original baseline weight after five years (Wadden & Foster, 2006). Thus, these interventions have failed to demonstrate sustained long-term weight loss outcomes. In contrast, bariatric surgery, also known as weight loss surgery, is a cost-effective intervention that generally results in long-term weight loss and a decrease in obesity related morbidity and mortality (Kissane & Pratt, 2011; Padwal et al., 2011). In the United States, the number of bariatric surgeries has increased from 16, 000 procedures annually in the early 1990s to more than 177, 000 cases in 2006 (Reiss, Baker, Lambert, Mathiason, & Kothari, 2008). In Australia, the pattern has been similar with approximately 500 bariatric surgeries performed in 1998–99 increasing to 17,000 in 2007–08 and 20,767 in 2013 – 14 (see Figure 2.3). Bariatric surgery is the most rapidly growing area of all surgical practices in Australia today (AIHW, 2010; O'Brien et al., 2004). Looking at this trend in more detail, the incidence of primary bariatric surgery in Australia has increased from 1,259 to 11,015 cases in the years 2000 to 2010 and the incidence of revisional bariatric surgery from 207 to 2,084 cases in the same period (Australian Goverment, 2015)

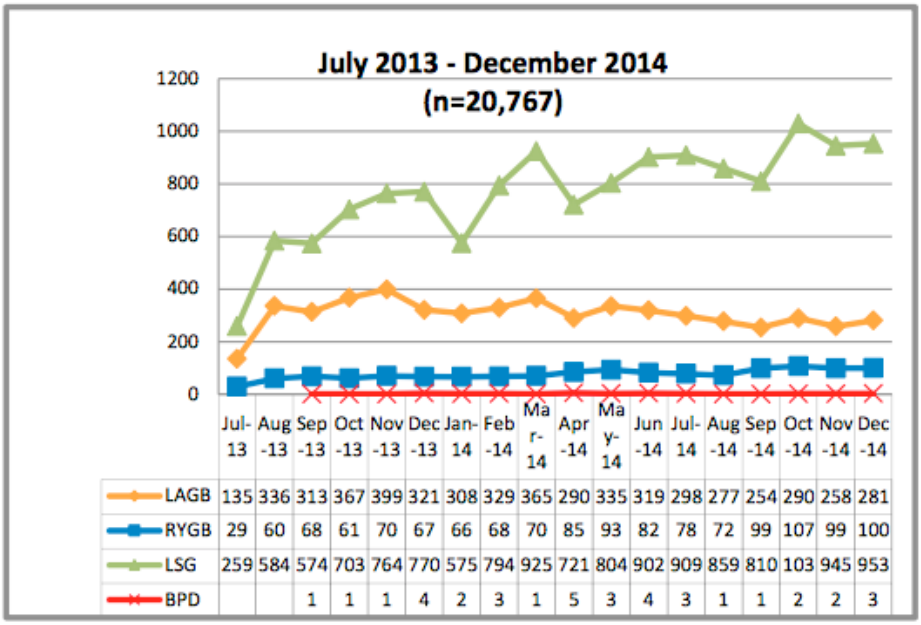


Figure 2.3. Estimated frequency of bariatric procedures in Australia (Australian Goverment, 2015)

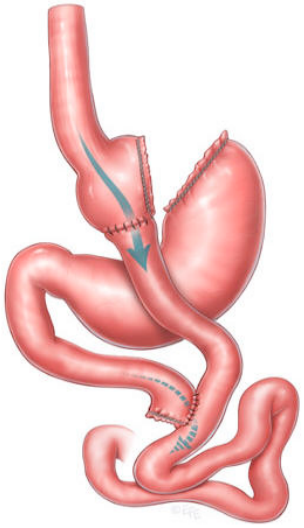
Bariatric surgery, rather than being one surgical procedure, refers to various surgical procedures designed to treat obesity by modification of the gastrointestinal tract (stomach and digestive system) to reduce caloric intake and/or impede absorption. Additionally, bariatric surgery reduces the food holding capacity of the stomach in order for the patient to experience satiety after eating a small portion of food (Mitchell & de Zwaan, 2005). However, it is still possible to eat small portions of calorie-dense food frequently which may result in failure to achieve weight loss or result in weight regain. Additionally, bariatric surgery does not inhibit the consumption of calories in liquid form. Rather than a complete solution, bariatric surgery is an adjunctive aid to assist patients struggling with obesity to achieve and maintain greater dietary control and achieve significant weight loss (Magdaleno, Chaim, Pareja, & Turato, 2011). Thus, bariatric surgery is not a quick fix to address obesity, as weight loss still depends on making healthy food choices and being physically active.

Until recently, Roux-en-Y gastric bypass (RYGB) was the most frequently performed surgical procedure for weight loss in the United States of America (USA) and was considered the gold standard procedure with the most robust long-term clinical outcome data (Nedelcu, Noel, Iannelli, & Gagner, 2015). The proportion of the laparoscopic sleeve gastrectomy (LSG) procedures increased from 3% to 54%

from 2008 to 2014 in the United States of America and the incidence RYGBP decreased from 52% in 2008 to 32% by 2014 (Abraham et al., 2015). Consequently, the LSG has now attained the status of a valid alternative to RYGB and has overtaken the LAGB in the hierarchy of bariatric surgical interventions (Nedelcu et al., 2015). Additionally, the LSG offers a better quality of life over gastric banding in that patients have a more normalized eating pattern (Noel et al., 2014). Thus, LSG is the now the most popular method of weight-loss surgery in USA, as it is a promising bariatric procedure and provides effective weight loss and resolution of co-morbidities for 3-5 years (Farrell et al., 2009). The LSG is perceived as less invasive, technically simpler and easier to perform when compared with Laparoscopic Roux-en-Y gastric bypass (RYGB).

2.1.4 Roux-en-Y Gastric Bypass (RYGBP)

Currently, bariatric surgery has two categories: combined malabsorptive/ restrictive procedures and gastric restrictive procedures. Malabsorptive/restrictive procedures such as Roux-en-Y Gastric Bypass (RYGBP; see Figure 2.4) remove or bypass a section of the digestive tract and limit the calories absorbed from food and physically restrict the size of the stomach and slow down digestion. In a RYGB, a partial bypass of the intestinal tract is performed to reduce the caloric absorption and decrease the size of the stomach to a small pouch. The small pouch holds a maximum capacity of ½ to 1 cup of food (Kalarchian et al., 2002).

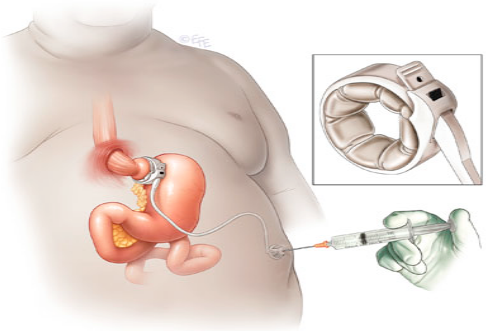


Source: Obesity Surgery Society of Australia & New Zealand

Figure 2.4. Diagram of Roux-en-Y Gastric Bypass (RYGBP)

2.1.5 Laparoscopic Adjustable Gastric Band (LAGB)

Laparoscopic adjustable gastric banding (LAGB), a gastric restrictive procedure, places a band around the top part of the stomach to effectively create a small pouch. Outflow from the pouch is controlled by the internal diameter of the band, which can be adjusted by a medical professional by adding saline solution to a reservoir, which sits under the skin (see Figure 2.5). The LAGB works by restricting the amount of food that can be eaten at a meal and by promoting satiety. It is crucial for LAGB patients to adhere to strict dietary guidelines by avoiding calorie dense food, high calorie liquids and soft snack foods. LAGB is an effective, safe bariatric procedure with low mortality and morbidity and is a popular bariatric procedure in the US, Europe, and Australia due to its simplicity, safety, adjustability, and reversibility (Goitein et al., 2011). Despite its safety and efficacy, LAGB has several drawbacks and patient compliance and physician vigilance are extremely important. There is frequent need for readjustments, re-operations are required for complications and patients may experience difficulties adjusting to the eating regime required post-surgery and, in some instances, results can be disappointing (Cohen, Pinheiro, Correa, & Schiavon, 2005; Gumbs, Pomp, & Gagner, 2007).



Source: Obesity Surgery Society of Australia & New Zealand

Figure 2.5. Laparoscopic adjustable gastric band (LAGB)

The longest study of LAGB bariatric surgery patients in Australia showed a significant number of patients maintained an average weight loss of 26 kilograms more than a decade after their procedure (O'Brien et al., 2013b). O'Brien et al.'s study included 3,227 participants, with a mean age of 47 years and a mean Body Mass Index (BMI) of 43.8 kg/m^2. Seven hundred and fourteen of these patients had completed at least 10 years of follow-up and achieved a mean of 47.1% of excess

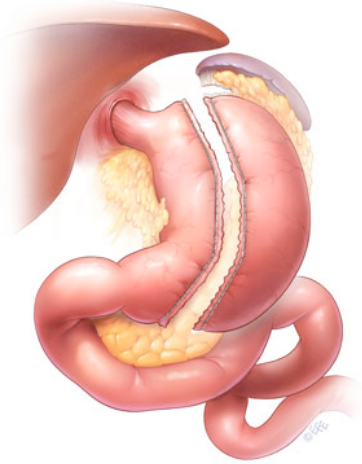
weight loss (EWL) at 15 years and 62% EWL at 16 years. However, not all initial surgeries achieve their desired outcomes, with some patients electing to have additional surgery. Another Australian study investigated 82 patients who had revision of LAGB to RYGB between December 2007 and April 2011 (Hii, Lake, Kenfield, & Hopkins, 2012a). Indications for surgery were inadequate weight loss (*n* = 42), adverse symptoms (reflux, *n* = 8; dysphagia, *n* = 2), and band complications (band erosion, *n* = 7; band sepsis, *n* = 1; band slip, *n* = 11; oesophageal dilatation, *n* = 11). The median BMI was 43 kg/m^2 pre-RYGB and 34 kg/m^2 12 months post-RYGB. The study concluded that LAGB has a considerable complication and failure rate and the conversion of these patients to RYGB resulted in further weight loss and resolution of adverse symptoms (Hii et al., 2012a). Thus, not all LAGB patients achieved EWL. Although this study provides surgical explanation for some failures, the majority of surgeries (51%) had been without complications but had still not resulted in EWL. Currently, little is known about the causes of failure to reach EWL for patients whose LAGB procedure is successful.

Although LAGB imposes restrictions on the type and volumes of food consumed in a period of time, requiring patients to eat small meals at regular intervals, LAGB does not dictate the choice of all foods. Therefore, patients are still able to consume calorie-dense foods with little or of no nutritional value such as soft drinks, sweetened fruit juices and sweets, fast foods, and potato chips. In addition, LAGB places little restriction on soft textured, high-calorie food such as ice cream or melted chocolate (M. Graham, Personal communication, August 23, 2013). Therefore, patients who graze post-surgery, particularly if this eating is in response to emotional distress, or due to boredom are likely to experience difficulties achieving EWL.

2.1.6 Laparoscopic Sleeve Gastrectomy (LSG)

LSG, also known as tube or vertical sleeve gastrectomy, is a bariatric surgery procedure wherein approximately 70 – 80% of the stomach is removed, effectively turning the stomach, into a long tube that restricts the volume of food that can be consumed (see Figure 2.6). As such, there is no foreign device to fail or cause obstruction, removing incidence of device failures. There is also no major alteration in the gastro-intestinal tract, thus LSG is not a malabsorptive procedure (Morales, Wheeler, Ramaswamy, Scott, & de la Torre, 2010). Most of the weight loss after

LSG takes place during the first 6 months after surgery and the weight loss gradually slows down thereafter, continuing up to 2 years postoperatively often followed by a slight regain in weight in the next few years (Helmiö et al., 2014). Although, the majority of bariatric patients achieve a successful post-surgical weight loss outcome, defined as ≥ 50% excess weight loss for the first 1-2 years post-surgery, a minority (15-20%) may not achieve this outcome (Maggard et al., 2005) or develop severe reflux and it is estimated that 20% of LSG patients will regain all of the weight lost (Benotti & Forse, 1996). Consequently, weight loss failure and intractable severe reflux in the longer-term, after primary LSG can necessitate further surgical interventions such as the revised sleeve gastrectomy (ReSG). In a recent study, sixty-one LSG patients (54 women, 7 men) with a body mass index (BMI) of 39.4 kg/m² elected to have a ReSG for insufficient weight loss, weight regain, and gastroesophageal reflux disease (GERD) (Nedelcu et al., 2015).



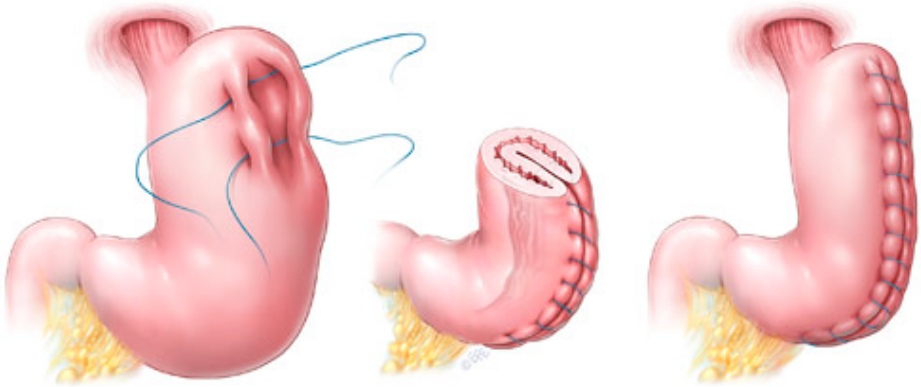
Source: Obesity Surgery Society of Australia & New Zealand

Figure 2.6. Laparoscopic Sleeve Gastrectomy (LSG)

2.1.7 Laparoscopic Sleeve Gastric Plication (LSGP)

Laparoscopic gastric plication (LSGP) is relatively new procedure that reduces the size of the stomach (see Figure 2.7) and does not involve the use of any foreign device such as, the device that is used for the LAGB. The LSGP is a laparoscopic key hole procedure and the stomach is mobilised or freed from its attachments and then the muscle lining of the stomach is essentially rolled up into the muscle tube itself (Kourkoulos et al., 2012). Therefore, the gastric capacity is reduced. The LSGP has potential advantages when compared to the LSG, mainly due to the fact that

there are no anastomotic lines and the risk of leak from a staple line is inherently non-existent (Kourkoulos et al., 2012). The LSGP is a potentially reversible procedure with an improved safety profile and reduced peri-operative risk. However, currently there is no long-term, or even medium term data, about sustained weight loss (Kourkoulos et al., 2012).



Source: Obesity Surgery Society of Australia & New Zealand

Figure 2.7. Laparoscopic gastric plication (LGP)

2.1.8 Revisional and Multiple Revisional Bariatric Surgery Procedures

Inadequate weight loss, weight regain and surgical complications or loss of quality of life are the indications for revisional bariatric surgery (Cohen et al., 2005). The type of revisional procedure varies as a result of the initial or primary procedure. Revisional surgery is significantly more challenging than the initial procedure as a result of post-operative adhesions, distorted tissues lanes and the change in the anatomy and is associated with increased morbidity rates (Hii, Lake, Kenfield, & Hopkins, 2012b). The majority of LAGB patients seeking revisional bariatric surgery have the LAGB surgically removed and are converted to a RYGB in a one stage procedure (Hii et al., 2012b). Some patients elect to undergo a two stage procedure and have the LAGB removed and then undergo a LSG 4-6 months later (Victorzon, 2012). Patients who have undergone a primary LSG but have not achieved EWL or have regained the weight lost or have developed certain complications, such as gastroesophageal reflux disease (GERD) may elect to have ReSG (Nedelcu et al., 2015).

Revisional bariatric surgery comprises 5%-15% of the total cases of bariatric surgery (Behrns, Smith, Kelly, & Sarr, 1993; Radtka, Puleo, Wang, & Cooney, 2010; Shimizu et al., 2013; Spyropoulos, Kehagias, Panagiotopoulos, Mead, & Kalfarentzos, 2010). Some patients undergo multiple bariatric surgeries in an attempt to achieve EWL, address weight regain, or resolve surgical complications or loss of quality of life (Coakley et al., 2008).

2.1.9 Bariatric Surgery Patient Demographics

Individuals with a BMI > 30 kg/m^2 with obesity-related co morbidities, and patients with BMI > 40/m^2 are regarded as suitable candidates for bariatric surgery (Brolin & Cody, 2007). BMI is calculated by dividing the weight (in kilograms) by the squared height (in metres) of an individual. The individual's BMI is thus compared to cut off scores assigned to the various weight ranges which describe a person's weight classification (see Table 2.1). An additional category is termed extreme obesity, defined as a BMI greater than 40kg/m. The prevalence of extreme obesity has increased significantly since the 1990s (Malone & Alger-Mayer, 2004). The majority of patients seeking bariatric surgery are female (Mahony, 2008; Sarwer, Wadden, & Fabricatore, 2005). This finding is supported by Buchwald et al.'s (2004) meta-analysis of 136 studies, with a total of 22,094 bariatric surgery patients. They found that 72.6% of the participants were female, 19% of participants were male, and sex was not reported for 8% participants. The overall mean age for participants included in this study was 39 years (range, 16-64). These data are comparable to the patient demographic (i.e., middle aged women) who present at both the sites for the present program of research, the Brisbane Obesity Clinic and the Brisbane Institute of Obesity Surgery.

Table 2.1: Weight Classification of Adults Relating to BMI

Classification	BMI	Risk of Co-morbidities
Underweight	< 18.50	Low (risk of other clinical complications increased)
Normal Range	18.50 - 24.99	Average
Pre obese (overweight)	25.00 - 29.99	Increased
Obese Class 1	30.00 - 34.99	Moderate
Obese Class 2	35.00 - 39.99	Severe
Obese Class 3	>40.00	Very Severe

Note. Source: World Health Organisation (2000). *Preventing and Managing the Global Epidemic*. Geneva: World Health Organisation.

2.1.10 Measures of Success

Patients who undergo bariatric surgery anticipate that the surgery will be a success and that they will achieve significant weight loss. Success is generally defined as an initial loss > 50% of EWL, which is a loss of 50% or more of the difference between current BMI and a BMI of 25 (Lim, Liew, Talbot, Jorgensen, & Loi, 2009). Another measure of the degree of success defines an excellent result as achieving a BMI < 30, achieving a BMI of 30-35 as good, and a poor result or failure as achieving a BMI > 35 (Gumbs et al., 2007). Suboptimal or inadequate weight loss is considered to be < 25% of EWL (i.e., a loss of less than 25% of the difference between current BMI and a BMI of 25) defined by the Reinhold criteria (Gumbs et al., 2007). The meta analysis by Buchwald et al. (2004) reported a range of between 40 to 60% EWL following LAGB. Hence, there are varied measures and definitions of what constitutes successful weight loss post-bariatric surgery.

Success may also be defined in terms of psychosocial factors as a resolution of co-morbidities and improvement in quality of life (QOL) and health related quality of life (HRQOL; see definitions provided in glossary). There is a plethora of evidence that QOL (Titi, Jenkins, Modak, & Galloway, 2007) and body image (van Hout, Fortuin, et al., 2008) improve and that there is diminishing of psychopathology (Maddi et al., 2001) in the majority of patients following bariatric procedures.

However, some studies have shown that a small number of patients experience post-operative psychological issues, such as depression, disordered eating, body image dissatisfaction, and suboptimal weight loss (Sarwer, Wadden, & Fabricatore, 2005). Thus, it may be suggested from the research that bariatric surgery may indirectly assist in improving the psychosocial functioning of some patients. However, improvements in psychosocial functioning are not observed for all patients and it is possible that diminished psychosocial functioning may lead to less than desirable weight loss outcomes. Developing an understanding of the psychosocial factors, as perceived by patients, that have hindered success and the perceived impact of bariatric surgery on QOL and HRQOL may assist in designing interventions that may facilitate a positive outcome for bariatric surgery patients who may otherwise not experience successful weight loss.

2.1.11 Quality of life and health related quality of life

Quality of life relates to an individual's experience of satisfaction and happiness related to physical, psychological, emotional, social, and spiritual aspects of life (Livingston & Fink, 2003). Mitchell et al. (2001) examined the impact of bariatric surgery on QOL in a long-term follow up study and improvements were noted in patients' long-term physical and mental QOL. Bariatric patients generally experience improvement in quality of life post-surgery (Andersen et al., 2010; Bocchieri, Meana, & Fisher, 2002a; Burgmer et al., 2007; Nguyen, Varela, Nguyen, & Wilson, 2006) and a strong positive correlation was found between the degree of improvement in quality of life and the degree of weight loss (Bult et al., 2008).

Health related quality of life (HRQOL) refers to the impact of health or medical conditions on general life functioning and encompasses physical activity and its limitations, physical functioning, pain, vitality, social life, mental health, and limitations due to person's psychological state (Fontaine & Barofsky, 2001). Importantly, HRQOL is determined not only by the health status of the patient but also by their emotional response to these problems (Dymek, Le Grange, Neven, & Alverdy, 2002). In a Swedish study involving obese patients, HRQOL improvements were noted in the 10 years following surgery (Karlsson, Taft, Rydvon, Sjvastrvam, & Sullivan, 2007). Improvements in HRQOL were associated with the percentage of weight loss but weight regain was associated with the gradual decrease HRQOL (Karlsson et al., 2007). Although these studies indicate a link between weight loss

and QOL and HRQOL, suggesting that weight loss influences QOL and HRQOL, few studies report the subjective experience of patients and in particular, the negative impacts of failure to achieve EWL and postoperative patient-reported outcomes such as taste changes and satisfaction with eating on QOL and HRQOL. Examining these patient-reported outcomes are important as there is a paucity of research that examines the individuals experience of the post-bariatric weight loss experience. Identifying these factors that patients report as contributing to their failure to achieve weight loss outcome and, thus, unsatisfactory outcome may assist health professionals designing interventions and in being cognisant of the patients experience and expectations.

2.1.12 Patients' Expectations

Studies report patients struggling with obesity unsuccessfully attempted to lose weight, using a variety of non-surgical interventions such as dieting, an average of 7 -15 times before making the decision to have bariatric surgery (Gibbons et al., 2006; Ray, Nickels, Sayeed, & Sax, 2003). Thus, patients have tried many diets in the past and are hopeful that bariatric surgery will bring about sustained weight loss. Some bariatric surgery patients believe that the surgery itself will cause a change in their eating behaviours and food choices and as a result they will lose weight (M. Graham, Personal communication, August 23, 2013). For many patients, this appears to be true. The surgical treatment of obesity results in an average weight loss of 20-40kg and a 10-15kg/m^2 reduction in BMI and weight loss is maintained for a period of up to 10 years (Bult et al., 2008). However, studies have indicated that, at 18-24 months post-LAGB surgery, weight loss stabilises and a significant proportion of patients experience weight regain (Eid et al., 2012; Hsu et al., 2002; Niego et al., 2007). There is a tendency for bariatric patients to attribute their difficulties in their relationships and social domain to their weight. Bariatric surgery is viewed as the final, drastic measure to lose weight and gain control over eating behaviour (Kaly et al., 2008; Ogden, Clementi, Aylwin, & Patel, 2005). Therefore, because of the degree of investment in this decision, for these patients, the outcome of surgery is likely to have significant effects not only upon weight loss, but upon patients' psychosocial wellbeing. However, as evidenced above, a number of patients do not experience EWL. Thus, there is likely to be both health related and psychologically related consequences for these patients. Some of the possible reasons for failure to

achieve EWL include the inability of bariatric surgery to change pre-existing unhealthy lifestyle and behavioural habits such as binge eating, night time eating, drinking high calorie dense liquids, and inactivity. Consequently, these behaviours may re-emerge post-surgery, limiting the effect of a bariatric procedure.

In a recent qualitative study, da Silva and da Costa Maia (2012b) explored the way in which obese patients conceptualize and deal with obesity and intervention for obesity. The aim was to explore the expectations and beliefs about the impact of weight loss surgery prior to undergoing surgery. The study included 20 women and 10 men and the participants had a mean BMI of 47.5 (*SD* = 8.2). The three main themes that emerged from the study were: obesity, eating behaviour, and treatment. Obesity was described as a stable and hereditary trait and, participants recognized that their individual patterns of eating behaviour contributed to and exacerbated obesity. However, participants in this study perceived that health professionals played the main role in the treatment for obesity. This study suggests three important psychosocial vulnerabilities that may be present in patients presenting for bariatric surgery: eating as a main coping strategy, possibly to deal with negative affect; weight-loss control is perceived to be in the hands of health professionals (i.e., external locus of control, lack of self-efficacy); and, options are limited: bariatric surgery is perceived as the only option to lose weight. These findings offer some important insights as to what factors may distinguish between patients who successfully lose weight following bariatric surgery and patients who do not. However, there is also a need to explore what individuals perceive as the factors that have contributed to them having revisional and multiple revisional surgeries. In addition, the perceived psychological impact of not achieving EWL and having revisional or multiple revisional surgery is unknown.

2.1.13 Obesity - A Multifactorial Disease

A key determinant of obesity is the balance between ingested calories as a result of eating behaviours and the body's basal energy expenditure. Obesity, therefore, results when small positive energy balances accumulate over a long period of time (Flegal, Carroll, Ogden, & Curtin, 2010). Thus, weight gain is cumulative and obesity develops over a period of time. The bio-psychosocial approach to explaining obesity, acknowledges that a complex array of genetic, nutritional, developmental and environmental factors impact on the development of obesity and

morbid obesity. It has been concluded that both genetic and environmental factors such as culture and socially-mediated food intake along with more sedentary lifestyles are involved in the obesity epidemic (Marti, Moreno-Aliaga, Hebebrand, & Martinez, 2004). Christakis and Fowler (2007) evaluated a network of 12,067 people who underwent repeated measurements over a period of 32 years and concluded that obesity may develop in social networks in a measurable and apparent pattern that depends on the nature of social relationships and interactions. Consequently, the development of obesity in social networks appears to be a factor in the obesity epidemic (Christakis & Fowler, 2007).

Classic twin studies suggest that the human body size is controlled by genetics, and it can be estimated that approximately 50% of the variance in the risk of developing obesity is explained by environmental factors, and the other 50% by genetic factors (Lemieux, Prud'homme, Bouchard, Tremblay, & Després, 1996; Stunkard, Foch, & Hrubec, 1986; Stunkard & Messick, 1985). Others suggest that obesity is the consequence of a high set point for adiposity based on a genetic predisposition which resists intervention but may be altered by lifestyle choices that include high levels of activity (Blomain, Dirhan, Valentino, Kim, & Waldman, 2013).

Nisbett (1972) proposed the set point theory in which each person has a homeostatically defended ideal weight or "set point" that is individually determined (Nisbett, 1972). According to this theory, obese individuals' set points are higher than normal weight individuals' set points due to a larger proportion of fat cells in obese individuals (Nisbett, 1972). Recent studies have reported that there is a physiological defence of body weight and that, after weight loss, changes in both energy expenditure and in hunger-controlling hormones encourage weight regain (Anastasiou, Karfopoulou, & Yannakoulia, 2015; Blomain et al., 2013). These physiological defences may contribute to the challenge of achieving or maintaining weight loss post-revisional and multiple revisional bariatric surgeries.

Physiologically, gut hormones are important regulators of energy expenditure and they have been implicated in the mechanisms of weight loss post-bariatric surgery as they cause a hunger and satiety effect and have an important role in appetite regulation (Pournaras & le Roux, 2009). After weight loss, changes in both energy expenditure and in hunger-controlling hormones encourage weight regain and

the reduction in energy expenditure (Vagenakis et al., 1977). This regulation occurs as the body produces more ghrelin to increase the appetite and reduces the production of leptin to decrease the metabolism. Nevertheless, there is limited research in this area and, in addition, little is known about these mechanisms of weight loss following a bariatric procedures such as, the LAGB (Tadross & le Roux, 2009a). However, there is strong evidence that the Roux-en-Y gastric bypass (RYGB) procedure impacts this weight regulatory system on multiple levels and resets the patients preoperative weight set point (Bueter, Ashrafian, & le Roux, 2009). Rates of short term weight loss post-revisional surgery in some studies have been comparable with the weight loss following primary surgery (Victorzon, Tolonen, & Sintonen, 2010). However, in other studies the revisional surgery patients achieved less weight loss than primary bariatric procedures (Linner & Drew, 1992). Taken together, these studies and hypotheses clearly highlight that the impact of the weight regulatory system on the weight loss and regain trajectory for patients undergoing revisional and multiple revisional bariatric surgeries is unknown. Further, they suggest that the inability to achieve or maintain EWL experienced by some patients may have a strong physiological basis and may not be only the consequence of the resumption of prior eating patterns, behaviours, food preferences, and inactivity levels.

In recent literature, an addiction model of obesity has been proposed. Addiction-like behaviours are seen as prevalent in a percentage of people suffering from obesity. For example, responses to certain foods (those high in fat, salt and sugar) are similar to responses to addictive substances insofar as they engage brain systems and provide hedonic pleasure and that they result in behavioural adaptations comparable to those engaged in drug use (da Silva & da Costa Maia, 2012b). Thus, this addiction model of obesity suggests that for some people there is an inability to suppress and restrict their negative eating behaviours that have developed through repetition, despite the negative consequences of weight gain and other effects of overeating.

Another theory, the Restraint Theory, was developed to evaluate both the causes and the consequences of the attempts to restrict food intake with the intent of losing or maintaining weight (Larsen, van Strien, Eisinga, Herman, & Engels, 2007). The Restraint Theory originated in the 1970s and postulates that eating patterns are

influenced by the biological need for food on the one hand, and the cognitive efforts (restraint) to resist that desire on the other (Herman & Mack, 1975). The Restraint Theory suggests that, "An over-reliance on cognitive control over eating, rather than physiological cues, may leave dieters vulnerable to overeating when these cognitive controls are disrupted by emotions or the intake of forbidden food" (Herman & Mack, 1975 p. 647-66). Further, that restraint can be both qualitative (type of food) and quantitative (amount of food). Thus, a perpetuating cycle of behaviour of rebound eating in response to the restriction of foods both in quality and quantity leads to increased consumption of specific high calorie dense foods because of the reward or the ability to consume them (Janse Van Vuuren, Strodl, White, & Lockie, 2015).

Another approach to conceptualising Obesity is Rotter's (1966) Social Learning Theory, which states that internal and external locus of control is described on a continuum and refers to the beliefs individuals have in the amount of control they have over the choices in their lives. Locus of control is a construct which has attempted to predict and elucidate health-related behaviours and choices (Neymotin & Nemzer, 2014). An internal or external locus of control itself affects, and is affected by, external and physiological factors and has been correlated with the risk for obesity (Neymotin & Nemzer, 2014). Locus of control is an important characteristic in relation to obesity because, as described above, it indicates whether an individual believes that his or her environment and the choices that are made are within their control (Neymotin & Nemzer, 2014). External weight locus of control is the belief that a persons weight can be attributed to factors outside of their control, such as luck, genes, fate, or social support (Stotland & Zuroff, 1990). In contrast an internal weight locus of control is the belief that an individual's own behaviour and choices determines their weight trajectory (Stotland & Zuroff, 1990). Therefore, having an internal locus of control is a potential predictor of achieving successful weight-loss and weight maintenance (Stotland & Zuroff, 1990). A study conducted by Nir and Neumann (1991) reinforced this hypothesis as the participants identified as having an internal locus of control achieved greater weight loss than the participants with an external locus of control (Nir & Neumann, 1991). Additionally, findings have indicated that those with internal locus of control generally showed more positive health behaviours and were more successful in achieving their initial

weight loss goals than program completers with similar values who had an external locus of control (Lefcourt, 2014). Similarly, studies have provided support for the relation between an external locus of control and disordered eating behaviours (King, 1989). Further, Williams et al. (1993) reported that participants in their study with bulimia had more of an external locus of control when compared to women struggling with obesity, non-obese dieters and normal controls.

Taken together, the above studies highlight that the development and maintenance of obesity is complex and that obesity is a multifactorial disease that develops from the interaction between a number of factors both psychological and physiological. Thus, the development of obesity involves the integration of genetic, social, physiological, metabolic, psychological and behavioural factors. However, to date our understanding of how and why obesity occurs is still incomplete and is not known in the longer-term how bariatric surgery, and in particular revisional and multiple revisional surgery, impacts on the development and maintenance some of these psychological and physiological factors.

2.1.14 Psychological Profiles of Bariatric Patients

There is a growing body of evidence that suggests that patients who are eligible for, or who present for bariatric surgery suffer from psychological distress. Numerous studies based upon structured diagnostic interviews indicate that bariatric surgery patients have a high prevalence rate of psychological disorders (Kalarchian et al., 2007; Legenbauer et al., 2009; Legenbauer, Petrak, de Zwaan, & Herpertz, 2011; Rosik, 2005). Weight loss surgery patients present with high rates of current and lifetime Axis I disorders, with rates of up to 70% (Kalarchian et al., 2007; Kalarchian et al., 2008), with affective disorders, anxiety disorders, and binge eating disorder being the most prevalent psychiatric disorders amongst these patients (Kalarchian et al., 2008). In a population based study, Onyike, Crum, Lee, Lyketsos, and Eaton (2003) found that morbidly obese individuals were five times more likely to be depressed compared to persons with average weight. Further, the risk of depression was increased for women more than men (Herpertz et al., 2006). Similarly, other recent evidence suggests that obese bariatric surgery patients report higher levels of depression, anxiety, and stress and lower scores on self-esteem and quality of life than people of normal weight (Abiles, Rodriguez-Ruiz, & Abiles, 2010). Similarly, Greenberg (2009) reported a high incidence of depression, negative

body image, eating disorders, and low quality of life in severely obese patients who were considering weight loss surgery. Additionally, patients suffering from obesity also show higher rates of eating disorders, in particular binge eating episodes, eating concerns, and elevated weight and shape concerns (Abiles et al., 2010). A number of studies suggest a relationship between sexual abuse and obesity, but in particular with relation to weight recidivism after achieving a successful weight loss outcome (Steinig, Wagner, Shang, Dölemeyer, & Kersting, 2012). Consequently, the experience of sexual abuse may also have a important impact on the weight loss outcome post-bariatric surgery (Steinig et al., 2012).

In summary, patients seeking bariatric surgery are more likely, in addition to obesity, to be suffering from eating and body image-related disorders, affective disorders and to be experiencing higher levels of stress, lower quality of life, and lower self-esteem. Despite the prevalence of co-morbid disorders, the impact of co-morbidity upon weight loss outcome is unclear. A number of studies indicate that pre-surgery anxiety and depressive disorders have an impact on both short- and long-term weight loss outcomes (Kalarchian et al., 2008; Legenbauer et al., 2009; Legenbauer et al., 2011), In contrast, other studies have not found that pre-surgical co-morbidity has an impact on postoperative weight loss (Dixon & O'Brien, 2002; Guisado et al., 2002). In order to examine the potential mechanisms by which these psychosocial co-morbidities may interact with effective weight loss, the following sections review empirical evidence related to the difficulties and co-morbid disorders identified above.

2.1.15 Interpersonal Trauma

Limited studies have investigated the impact of traumatic experiences such as sexual abuse on bariatric surgery outcomes. This is an important area to investigate, as some researchers have postulated that obesity can be regarded as an adaptive defence or a self-protecting mechanism (Ray et al., 2003; Wiederman, Sansone, & Sansone, 1999). According to this theory, patients struggling with obesity who are sexual abuse survivors perceive their additional weight as protection from potential sexual advances (Steinig et al., 2012). Weight loss, which increases the perception of being attractive and thus the possibility of being approached by the opposite sex, may escalate the fear of a possible repeat traumatic incidence (Steinig et al., 2012). Evidence for this hypothesis is supported as weight loss has been found to trigger

post-traumatic stress disorder symptoms in some women who have experienced an interpersonal trauma or abuse (King, Clark, & Pera, 1996). These limited studies suggest that the experience of an interpersonal trauma such as sexual abuse may impact on the weight loss and long-term weight maintenance trajectory of bariatric surgery patients.

2.1.16 Body image dissatisfaction and eating disorders

Weight and shape concerns have been identified as the strongest predictors of clinical eating disorders (Fittig, Bryson, Wilfley, Kraemer, & Taylor, 2011) and individuals with severe obesity commonly report poor body image. For body image disorders, risk factors include the extent of being overweight and being female (Fittig et al., 2011). The findings concerning changes in body image after bariatric surgery have been inconsistent (Teufel et al., 2012). Partial improvement has been reported post-LAGB in some studies (De Panfilis et al., 2007; van Hout, Fortuin, et al., 2008; van Hout, Vreeswijk, & van Heck, 2008). In a study examining the differences between successful and unsuccessful outcomes post-LAGB, Hotter et al. (2003) studied 77 bariatric surgery patients. The participants were recruited 12 months after LAGB, and were asked questions concerning their socio-demographic status, postoperative course, past and present weight status, eating behaviours and difficulties in changing eating habits, and perception of body image. There were no significant preoperative differences between the 71% of patients in the good outcome group and the 29% in the poor outcome group in terms of the surgery. However, following LAGB, patients in the good outcome group reported fewer problems adapting to new eating behaviours, significantly fewer post-surgical complications, and an improvement in body image dissatisfaction. These findings seem to suggest that body image dissatisfaction prior to bariatric surgery is not predictive of failure to achieve EWL. In addition, there is evidence that may suggest that a persistently negative body image may be due to depressive symptomatology rather than failure to lose weight (Adami, Meneghelli, Bressani, & Scopinaro, 1999; Grilo, Masheb, Brody, Burke-Martindale, & Rothschild, 2005).

2.1.17 Revisional Bariatric Surgery for inadequate weight loss

As described above, bariatric surgery does not result in EWL for some patients who suffer from obesity. For these patients, revisional bariatric surgery is an option.

While the percentage of revisional bariatric procedures for surgeries is increasing (Schouten, Wiryasaputra, Dielen, Gemert, & Greve, 2010) the exact percentage of procedures in unknown due to differences in reporting surgical procedures, differing item numbers, follow-up times and high patient attrition rates. The percentage of weight loss post-revisional surgery is varied and is estimated at approximately 50% EWL (Linner & Drew, 1992). Hence, there are a significant proportion of revisional patients who do not achieve EWL. The percentage of patients who do not achieve EWL is estimated at 35%, if suboptimal weight loss is defined as achieving < 50% EWL (Benotti & Forse, 1996), and the most common indication for revisional surgery is suboptimal weight loss or failure to maintain adequate weight loss (Benotti & Forse, 1996). There is no clarity regarding the reasons for this inadequate weight loss in revisional patients. However, it has been hypothesised that the physiological changes from the second surgery are not as dramatic or that patients undergoing revisional surgery may have struggled to make the lifestyle and behavioural changes required post-initial bariatric surgery (Mitchell & de Zwaan, 2005). In a study of 46 revisional bariatric surgery patients, 43% of patients had their bands removed before having a revisional procedure and the rest had their band removed during the revisional procedure. The reasons for band removal were: for 13 (28%) of the patients, band intolerance due to intractable vomiting, pain, and inability to comply with diet; band complication in 10 patients (22%); and insufficient weight loss in 23 (50%) of patients (Goitein et al., 2011). Although some patients presented for revisional bariatric surgery due to complications following initial bariatric surgery, the majority of patients sought revisions surgery due to failure to achieve more than 50% EWL following LAGB.

In a recent study Manning et al. (2015), demonstrated that there is a wide variability in weight loss response after both RYGBP and LSG. Moreover, patients who ultimately experienced suboptimal weight loss after either procedure were identified primarily during the 3–6-month postoperative period. Thus, this time period offers the opportunity for early adjunctive interventions that could enhance their weight loss response and alter the poorer weight loss trajectory and, thus the need for revisional bariatric surgery and multiple revisional surgeries (Manning et al., 2015).

With a trend of increasing obesity in Australia and across the globe, there has also been a substantial increase in the number of bariatric surgeries, revisional, and multiple revisional procedures being performed and there is limited qualitative data available from patients who have undergone bariatric surgery (Malone & Alger-Mayer, 2004). The current body of research clearly indicates that obese bariatric surgery patients report higher levels of depression, anxiety, and stress and lower scores of self esteem and quality of life than people of normal weight and have higher rates of eating disorders, including binge eating episodes, eating concerns, and elevated weight and shape concerns (Abiles et al., 2010). Patients presenting for revisional and multiple revisional bariatric surgeries are an understudied population and, to my knowledge, no study in an Australian setting has explicitly focused on the identifying early determinants of lower weight loss trajectories for primary bariatric surgery patients and examined the possible psychosocial factors that contributed to weight loss failure for revisional surgery patients and multiple revisional surgery patients. Examining the potential psychosocial causes of an unsuccessful weight loss outcome in patients who have had multiple revisional weight loss surgeries is important, as it may assist in identifying unique psychosocial factors, combinations of factors, or intensity of factors that explain these patients' repeated EWL failures. To my knowledge, no study has examined if multiple revisional patients have unique psychosocial features that distinguish them from primary revisional bariatric surgery patients. Thus, examining and comparing revisional and multiple revisional bariatric surgery patients' psychosocial presentation may also provide the opportunity to identify unique features of each cohort.

2.1.18 Eating behaviours post-weight loss surgery

After weight-loss surgery, patients are required to reduce their intake of food and change their patterns of eating. Bariatric dieticians recommend that post surgery patients have three to five portion controlled meals per day, stop eating when they experience satiety, and avoid high calorie dense foods and calorific liquids (van Hout, Jakimowicz, Fortuin, Pelle, & van Heck, 2007). Further, bariatric surgery patients are required to eat slowly, thoroughly chew food and not eat food and drink fluids together (M. Graham, Personal communication, August 23, 2013). In the past, the variability in post-surgical weight loss outcomes has been largely attributed to activity levels and failure to change problem eating behaviours and the impact of

these on weight loss outcomes (Larsen, Geenen, et al., 2004). Dysfunctional eating behaviours include binge eating, night eating syndrome, grazing, and "emotional eating". However, while there is some emerging evidence of dysfunctional eating behaviours being predictors of outcome in bariatric surgery patients, other plausible factors such as food cravings and taste changes that impact on food preferences post-bariatric surgery have not been extensively studied.

Binge eating behaviours

Research has indicated that there is a high prevalence of binge eating amongst patients who seek bariatric surgery and that binge eating has been shown to be an indicator of difficulties with post-surgical weight loss (Hsu et al., 1998; Hsu, Betancourt, & Sullivan, 1996). More recent studies seem to contradict these findings, suggesting that binge eating remits for the first 6-12 months post-surgery (Boan, Kolotkin, Westman, McMahon, & Grant, 2004; Bocchieri-Ricciardi et al., 2006; Colles, Dixon, & O'Brien, 2008b; Malone & Alger-Mayer, 2004; White, Kalarchian, Masheb, Marcus, & Grilo, 2010) and that pre-surgical bingeing does not predict poorer weight loss or psychosocial outcomes within the initial 6-24 months post-surgery (Colles et al., 2008b; Latner, Wetzler, Goodman, & Glinski, 2004; Malone & Alger-Mayer, 2004; Mitchell et al., 2001). However, studies with longer follow-up periods have found that patients with preoperative binge eating behaviours are at higher risk of developing later problematic eating behaviours post-surgery (Bocchieri-Ricciardi et al., 2006; Hsu et al., 1996; Kalarchian et al., 2002; Sarwer, Wadden, & Fabricatore, 2005; Saunders, 2004). Further, these problematic eating behaviours are related to a higher risk for weight regain in the long-term and, if present, typically occur at 18-24 months post-surgery (Burgmer et al., 2005a; Hsu et al., 2002; Larsen, van Ramshorst, et al., 2004; Saunders, 2004). These studies suggest that, although binge eating behaviours initially subside following bariatric surgery, they may return 18-24 months later and current research provides little explanation as to why this occurs.

Night Eating Syndrome

The prevalence of night eating syndrome (NES) has been estimated at 8% to 27% in patients seeking bariatric surgery (Adami et al., 1999). NES following bariatric surgery has been associated with a greater BMI post-surgery and lower satisfaction with surgery (Latner et al., 2004). In more recent studies, Sarwer and

Wadden (2005) found that 2% to 9% of patients seeking bariatric surgery met the criteria for NES and 5-40% met the criteria for NES (Sarwer, Wadden, Moore, et al., 2005) and continued to engage in night-time eating postoperatively (Colles, Dixon, & O'Brien, 2007; Rand, Macgregor, & Stunkard, 1997). The range of prevalence rates for NES in bariatric surgery patients is possibly due to the lack of standardised assessment and exact definitions for NES. However, it appears that bariatric surgery offers little improvement in NES and that NES has negative effects on weight loss outcomes following bariatric surgery.

Grazing

Grazing eating behaviours have been defined as "consuming smaller portions of food continuously over an extended period of time" over a period of 6 months (Saunders, 2004). Busetto et al, (2005) defined a similar concept called "nibbling" which was explained as eating small quantities of food between meals, typically triggered by inactivity and or loneliness. Zunker, Carr, Saunders and Mitchell (2012) undertook a qualitative study to explore eating behaviours post-bariatric surgery and to develop a better understanding of the term "grazing". Responses from 105 participants were categorised into 17 themes. Common themes included eating frequently all through the day, out of control eating, and eating due to boredom not hunger.

Emotional Eating

Bochierri Meana and Fisher (2002) have suggested the term "emotional eaters" to describe bariatric patients who deal with and regulate negative emotional states by eating calorie dense sweet food to cope with loneliness and boredom or to reduce stress. They found that these patients had difficulties in adapting to the required changes in eating behaviour post-surgery (Bocchieri et al., 2002a). This emotional relationship with food, although seldom reported in the bariatric literature, may influence a patient's eating patterns (Zunker et al., 2012). A sense of loss of control and overeating in response to emotions has been associated with difficulties adjusting to eating smaller volumes of food post-bariatric surgery (Poole et al., 2005; Saunders, 2004).

Emotional eating is estimated to be present in 38% of bariatric surgery candidates (Miller-Matero et al., 2014). Emotional eating follows a circular pattern and is reinforced through repetition (Chesler, 2012) and, therefore postoperative

bariatric surgery patients who eat in response to negative emotions may not achieve EWL or experience weight recidivism over time. Rusch and Andris (2007) reported in a study at 12 months pre operatively of RYGB patients that 37% reported eating patterns of snacking and grazing to relieve negative feelings of stress, frustration, and loneliness and these patients ultimately resumed pre surgical patterns of snacking to relieve and decrease the intensity of negative emotions. Further, these patients achieved a lower rate of weight loss in comparison to patients who did not report patterns of emotional eating pre-operatively (Rusch & Andris, 2007). Delin et al. (1995) found that eating in response to emotional cues such as anxiety or loneliness post-bariatric surgery was negatively correlated with EWL (Delin, Watts, & Bassett, 1995). Additionally, Chesler (2012) reported that weight loss surgery patients who partook in higher levels of uncontrolled, emotional eating, in response to negative emotions achieved a lower EWL and experienced greater weight recidivism than patients who were not emotional eaters.

As has been described in this chapter, numerous studies have examined the eating behaviours of patients post-bariatric surgery; however, there is limited research regarding the change in eating behaviours in the shorter term and how these eating behaviours may impact the early weight loss trajectory and thus the weight loss outcome. Research is required to understand the individual's perspective of their eating behaviours and how they perceive that their eating behaviours have influenced their failures to achieve EWL.

Food Cravings

Some maladaptive eating behaviours have been studied within the bariatric population and have demonstrated some predictive ability with regards to post-operative weight loss while other eating behaviours (e.g., food cravings) have not been extensively studied (Crowley et al., 2012). The cravings for food are strong physiological or psychological desires that encourage the quest for and eating of a specific food (Cepeda-Benito, Gleaves, Williams, & Erath, 2001). However, cravings for food can occur in the absence of physical hunger (Cepeda-Benito et al., 2001).Thus, food cravings are different from the experience of homeostatic hunger in that they are conceptualized as a subjective experience and an intense desire for specific food (Chao, Grilo, White, & Sinha, 2014; Rabinovitz, 2005). Additionally, food cravings are typically for high calorie dense foods (White et al., 2002) and

elevated food cravings are associated with a higher intake of the types of foods craved and a higher BMI (Chao et al., 2014). Further, episodes of overeating may be precipitated by food cravings and food-related cues (Jarosz, Dobal, Wilson, & Schram, 2007). Food cravings are experienced by most people on occasion (Weingarten & Elston, 1990). However, more frequent and more intense food cravings are associated with eating disorders such as binge eating disorder and with obesity (Abiles et al., 2010). Additionally, food cravings have gained attention for their potential role in linking addictive behaviours and eating disorders (Kozlowski & Wilkinson, 1987; Verheul, van den Brink, & Geerlings, 1999). Thus, additional research is needed to understand the role and the impact of food cravings on the weight loss and weight maintenance outcome post-bariatric surgery.

Taste changes post-bariatric surgery

Taste is an important factor governing eating behaviour as it contributes to food preference and it is thought that it can modulate appetite and caloric intake (Berthoud & Zheng, 2012). Taste-related food reward from eating behaviours has been separated into the psychological and neural components; liking (enjoyment), wanting (desire), and learning (Berthoud & Zheng, 2012). Patients suffering with obesity report higher hedonic hunger and higher enjoyment for sweetness and fatty tastes compared with normal weight subjects (Bartoshuk, Duffy, Hayes, Moskowitz, & Snyder, 2006). However, this is a minor emerging area in the current bariatric literature and few studies have examined or identified taste as a factor impacting on eating behaviour post-bariatric surgery. A recent study reported that there is a change in taste perception post-RYGB, as patients reported an increased preference for lower fat and less sweet tasting foods and reported finding the eating experience less enjoyable (Behary & Miras, 2015). These changes in RYGB in food preferences were strongly attributed to changes in the perception of taste and the hedonic enjoyment of eating (Behary & Miras, 2015). A short term pilot study (n = 15) assessed food preference changes before and 6 weeks after vertical sleeve gastrectomy (VSG), and concluded that VSG reduced the preference for calorie dense foods that were high in sugar and high in sugar and complex carbohydrates. Further, that the changes in food preferences may contribute to weight loss with VSG in the longer-term (Ammon et al., 2015). Furthermore, as previously stated, taste has been recently identified in studies as important factor governing eating behaviour

as it contributes to food preference and it is thought that it can modulate appetite and caloric intake (Berthoud & Zheng, 2012). This indicates that it may be important to explore the role of taste changes in food preference post-bariatric surgery and the consequent impact on weight loss outcome. While there is a growing research literature on psychosocial and psychological factors that predict weight loss outcomes, a paucity of research has explored patient-reported outcomes that may contribute to the weight loss trajectory outcome. Therefore, further research is required to explore the postoperative role of perception of taste changes and the impact of these perceived taste changes on food preferences and ultimately the long-term influence on the weight loss trajectory.

2.1.19 Social Support

In a recent review article to investigate the relationship between post-operative support groups and other forms of social support on expected weight loss after bariatric surgery, Livhits et al. (2011) suggested that social support may be associated with increased weight loss after bariatric surgery. In their review, a total of 10 studies explored social support and bariatric surgery weight loss outcomes, five of the studies explored the role of support groups and a further five studies explored other forms of social support (such as perceived family support or number of confidants) and expected weight loss outcome post-operatively. Livhits et al.'s review found that support group attendance post-operatively was associated with greater expected weight loss outcome. Similarly, Vishne et al. (2004) suggested that family and social support may increase weight loss following surgery by helping patients to deal with psychosocial stressors and dietary changes. In a retrospective cohort study of 450 bariatric patients, Vishne et al. found that those who had social support post-operatively experienced the most satisfactory emotional outcome. Thus, further research is required to explore if having perceived support from both family and friends and attending support groups may be associated with achieving expected weight loss outcome and weight maintenance after bariatric surgery.

2.1.20 Chapter Summary and Implications

This chapter has summarised literature which suggests that with a trend of increasing obesity in Australia and across the globe, there has also been a substantial increase in the number of bariatric surgeries, revisional, and multiple revisional

procedures being performed and that bariatric surgery is mostly an effective treatment for obesity. This chapter has explored the theoretical explanations for obesity and the impact of the weight regulatory system on weight loss and maintenance. The current body of research clearly indicates that obese bariatric surgery patients report higher levels of depression, anxiety, and stress and lower scores of self-esteem and quality of life than people of normal weight and have higher rates of eating disorders, including binge eating episodes, eating concerns, and elevated weight and shape concerns (Abiles et al., 2010). Further, psychological factors such as symptoms of disordered eating are common among patients seeking weight loss surgery and they can impair adherence to making the recommended lifestyle and eating behaviour changes. However, while there is some emerging evidence of dysfunctional eating behaviours being predictors of outcome in bariatric surgery patients, other plausible factors such as food cravings that impact on food preferences post-bariatric surgery have not been extensively studied. As has been described, numerous studies have examined the eating behaviours of patients post-bariatric surgery; however, there is limited research regarding the change in eating behaviours in the shorter term and how these eating behaviours may impact the early weight loss trajectory and thus impact on the weight loss outcome. Research is required to understand how obese individuals view their eating behaviours and how they perceive that their eating behaviours have influenced their failures to achieve EWL. Further, there is no clarity regarding the reasons for inadequate weight loss in revisional and multiple revisional bariatric surgery patients. Therefore, this research project focuses on identifying causes of weight loss failure for bariatric surgery patients, revisional surgery patients and multiple revisional surgery patients by examining patients' psychosocial functioning and their perceptions of psychosocial factors that may contribute to these failures. This section concludes by arguing for the necessity of research in the identifying early causes of lower weight loss trajectories for primary bariatric surgery patients and weight loss failure for revisional surgery patients and multiple revisional surgery, and investigating patient-reported outcomes that may impact upon their weight loss trajectory. Therefore, this thesis will explore these identified gaps in the current research literature related to primary LSG and revisional and multiple revisional bariatric surgery patients and in doing so can assist medical professionals, allied health professionals, weight loss surgery patients, their families and the wider community by (i) improving the

understanding of patients' experiences of undergoing revisional surgery or multiple revisional surgeries and, (ii) identifying the factors that contribute to not achieving EWL or contribute to post-surgery weight recidivism.

Chapter 3: Research Design

Chapter 2 outlined the prevalence and consequences of obesity and highlighted that, although bariatric surgery is mostly an effective intervention for this chronic disease, not all patients achieve a successful weight loss outcome. This chapter describes the design adopted by this research to achieve the aims and objectives stated in section 1.2 of Chapter 1. As described in Chapter 1, the thesis is comprised of a number of research aims that are addressed using both qualitative and quantitative methods. The thesis includes three studies: one quantitative and two qualitative studies. The purpose of this chapter is to outline the methods used to achieve the aims and objectives outlined in Chapter 1 and these are described as follows:

- Section 3.1 discusses the research aims and questions of the program of research,
- Section 3.2 justifies the methodology and section 3.3 describes the research design employed for the studies,
- Section 3.4 describes the participants included in each study,
- Section 3.5 discusses the procedure that was undertaken for each successive study and
- Section 3.6 describes the instruments used for each study,
- Section 3.8 briefly discusses the analytic approach to each stage of research, and
- Section 3.9 describes the program of research.

The chapter concludes with requisite ethical compliance details.

3.1 RESEARCH AIMS AND RESEARCH QUESTIONS

The overall aim of the program of research was to understand the psychosocial factors that impact on the weight loss trajectory of primary and revisional and multiple revisional bariatric surgery patients. These aims were addressed through three studies:

3.1.1 Study 1

1. What do patients who have undergone a single revisional procedure perceive has contributed to them not achieving an expected weight loss outcome post-LAGB?
2. How do patients who have undergone a primary bariatric surgery perceive and describe the factors that contributed to them seeking revisional bariatric surgery?

3.1.2 Study 2

1. What do patients who have undergone multiple revisional procedures perceive has contributed to them not achieving an expected weight loss outcome post-LAGB?
2. What are patients' perceptions and how do they describe the factors that have contributed to them having multiple revisional bariatric surgeries?
3. How do the perceptions of patients who have undergone a single revisional procedure differ from patients who have undergone multiple revisional procedures in terms of psychosocial factors?

3.1.3 Study 3

1. Can explanatory models (developed from Study 1 & 2) predict the expected weight loss trajectory in patients undergoing a primary bariatric procedure? If so, what are the important psychosocial factors?

3.2 METHODOLOGY

In planning this program of research, the choice of methodology was an important consideration and various research methods were evaluated for their ability to provide meaningful answers to the present research aims, which were both exploratory and specific (section 3.1). Based on the evaluation of methodology and the ability of the various approaches to address these research aims, a combination of methodologies incorporating both qualitative and quantitative research was employed. Studies 1 and 2 focussed on the range and individual variation of experiences of patients who have undergone LAGB surgery, who have not achieved EWL and were seeking revisional bariatric surgery (Study 1) or multiple revisional surgeries (Study 2). Study 3 utilised the constructs identified as important in the

qualitative Studies 1 and 2 to identify what psychosocial factors predicted early lower rates of weight loss in a primary bariatric procedure.

In deciding which method of qualitative analysis to utilise in Study 1 and 2, a review of some of the main approaches used in interpretation of qualitative data was conducted. It was important that this decision process was done thoroughly, with careful consideration given to how the aims of the current program of research matched with the theoretical orientation of each approach. The term "qualitative methods" has been used as an overarching term for a diverse group of methodologies with different theoretical underpinnings, thus offering a variety of different ways of approaching data collection and analysis (Kuper, Lingard, & Levinson, 2008). The most challenging aspect of conducting qualitative research lies in the appropriate analysis of the data (Priest, Roberts, & Woods, 2002). Four different approaches were considered: content analysis, narrative analysis, mixed methods and grounded theory.

Qualitative content analysis originated in the 1950s to analyse content of media text and in this method, text is broken into quantifiable units (Priest et al., 2002). Content analysis is a widely used qualitative research method of eliciting meaning from text and it facilitates contextual meaning in text through the development of emergent themes (Priest et al., 2002). The repetition of coding produces the significance of particular themes. Consequently, it is particularly suited to qualitative computerised analysis where large sections of text can be rapidly coded (Priest et al., 2002). Content analysis was not chosen for Study 1 and 2 as it was not suitable for the research questions and aims as this method did not facilitate the development and generation of a theory/theories grounded in the participants' experience.

Narrative analysis on the other hand is a method of finding meaning in qualitative data, which proposes that within any set of textual data, stories can be found (Riessman, 1993). Individuals are seen as expressing their emotions, thoughts, beliefs, and ideas on certain subjects and generally making sense of their world through telling stories (Priest et al., 2002). Stories are defined as sections of text where a definite beginning, middle, and end can be identified (Riessman, 1993). Narrative analysis was not chosen for Study 1 and 2 for a number of reasons. Firstly, this method lends itself best to unstructured interviews where the flow of the story is uninterrupted (Priest et al., 2002). As the interviews designed for both Studies 1 and

2 were of a semi-structured format, narrative analysis was deemed less appropriate. Secondly, narrative analysis has been criticised for the fact that, despite following a prescribed procedure, researchers arrive at differing conclusions with regard to the structure and meaning of the story, and because the analysis is open to many different interpretations (Priest et al., 2002).

Mixed-methods research integrates elements from both qualitative and quantitative paradigms in a single study or a longitudinal program of inquiry. The purpose of mixed methods is that both qualitative and quantitative research, in combination, provide a better understanding of a research problem or issue than either research approach alone. Fundamental to the effectiveness of this approach is making sure that the methods are used appropriately, to ensure that they triangulate to produce greater insight and understanding than single methods (Lingard, Albert, & Levinson, 2008). Health researchers have increasingly turned to the mixed-methods approach in order to expand the scope and deepen the understanding of the topic under investigation (O'Cathain, Murphy, & Nicholl, 2010). Three techniques that can help researchers to integrate data from different components of a mixed methods study are: a triangulation protocol, following a thread, and the mixed methods matrix (O'Cathain et al., 2010). All methods have specific limitations as well as particular strengths and a mixed-methods approach may have been used to further expand and deepen the findings of the program of research.

Unlike narrative, content analysis, and mixed methods, grounded theory is a method of qualitative analysis whereby theory is generated through inductive examination of data. This approach was originally described by Glaser and Strauss (1967) and later by Strauss and Corbin (Corbin & Strauss, 1990; Strauss & Corbin, 1998) and Charam (2003). It involves a systematic process of gathering, analysing, and conceptualising qualitative data with the primary aim of developing a coherent theory that is grounded in the natural context of the research (Charmaz, 2006). The grounded theory philosophical approach has positivist and objectivist underpinnings; positivist in that it assumes that there are universal explanations for how people resolve their concerns and that these explanations can be discovered; and objectivist in that it positions the researcher as a neutral observer who discovers the theory, using a reductionist approach of enquiry in order to render the theory from the data in an objective way (Strauss & Corbin, 1998). It differs from other methodologies in

that it uses data to generate theory rather than using data to confirm or disconfirm an a priori theory or hypothesis.

Justification for Grounded Theory - Phase 1

Grounded theory is best applied in contexts where a researcher seeks to develop an explanation for a social phenomenon. Thus, grounded theory provided an avenue to examine the participants perceptions and feelings regarding their experiences with weight loss surgery. Quantitative data may be useful in measuring attitudes across a large sample; however, grounded theory offered a methodological framework for this study as its aim was to learn about the participants perceptions of the factors that had contributed to unsuccessful outcomes. Further, prior research has indicated that qualitative research is important as it elucidates the understanding of the perspectives of the needs of individuals who are overweight and obese (Thomas, Hyde, Karunaratne, Herbert, & Komesaroff, 2008). Grounded theory is not prescriptive in that it does not assume or define specific tools or instruments that must be used to discover more about research questions (Charmaz 2006). Rather, grounded theory allows the researcher to investigate the area of interest, utilising open-ended questions in the semi-structured interviews to discover more from a participant's own perspective. In analysing these data, the researcher seeks to identify parallels, patterns, themes, and commonalities. This process is achieved by extracting those phenomena or experiences significant to the participant by assigning each a conceptual label, known as a code. The structured approach of grounded theory was identified by McCallin (2003) as being supportive of new researchers to grounded theory; it has been criticised for being overly prescriptive and complex. Nevertheless, Strauss and Corbin (1998) stated that researchers need to be flexible when applying this process to avoid forcing the data (Hunter, Murphy, Grealish, Casey, & Keady, 2010). Corbin and Strauss (Corbin & Strauss, 2008; Strauss & Corbin, 1998) are clear that researchers should trust their instincts and not focus too closely on the analytical procedures.

Researchers approach the world with a set of beliefs and ideas regarding the nature of being, reality, and truth (Chamberlain-Salaun, Mills, & Usher, 2013). Guba and Lincoln (1994) suggest that the choice of the research methodology is determined and influenced by this inherent guiding belief system or world view. Therefore, to ensure rigorous research, selecting a paradigm congruent with the

researcher's philosophical foundations is considered essential. As a psychologist, the researcher works within a framework of delivering evidence-based practice. Consequently, there was an emphasis on conducting quality research, which aligned with the historical predisposition within her discipline for a post-positivist approach to scientific inquiry. Before selecting grounded theory for the qualitative stage of the program of research, the researcher considered her paradigmatic inclinations as being constructivist with respect to research and knowledge development. Primarily, the researcher believes that each individual's experience and perception of reality is unique and varies significantly. However, there are commonalities of reality experienced by different people exposed to the same phenomenon. This viewpoint aligns with the constructivist paradigm, where subjectivity is embraced from an epistemological stance and where multiple realities are accepted in the construction of knowledge during the research process (Guba & Lincoln, 1994). Additionally, the researcher believes participants' meanings of phenomena are not only shaped through social interactions, but are contextual and change over time. This is in keeping with Blumer's (1969) articulation of symbolic interactionism, which is recognized as the philosophical foundation to grounded theory (Charmaz, 2014; Corbin & Strauss, 2008).

Since its inception, grounded theory has reflected different ontological and epistemological perspectives (Charmaz, 2014). Glaser continued to develop what he calls classic grounded theory that emphasizes an objective stance and emergent discovery of theory from the data (Glaser, 1978; Strauss and Corbin 1990) and collaborated to develop qualitative analysis informed by Chicago School pragmatism and philosophies of symbolic interactionism (Charmaz, 2014; Corbin & Strauss, 2008). Additionally, Charmaz (2006) proposed an approach to grounded theory that supported a constructivist stance in qualitative inquiry, including co-construction of knowledge with participants and recognition of interpretation in analysis. Consequently, grounded theory has been recognized as a suitable methodology to gain an understanding of underlying social processes associated with a phenomenon (Charmaz, 2014; Corbin & Strauss, 2008; Glaser & Strauss, 1967). Consequently, the researcher concluded that grounded theory methodology was the best fit with her epistemological perspective and was, therefore, chosen for the qualitative Studies 1 and 2. The qualitative phase of program of research utilised the strategies that are

common to all grounded theory; concurrent data generation or collection and analysis; constant comparative analysis; initial coding and categorization of data; intermediate coding; selecting a core category; advanced coding; theoretical integration; theoretical sampling, theoretical saturation; theoretical sensitivity; and writing memos (memoing), theory building, theoretical sampling, constant comparison, coding, and memo writing (Charmaz, 2014; Corbin & Strauss, 2008; Glaser, 1978).

The central principle of data analysis in the grounded theory method is constant comparison (Glaser, 1992). This process involves simultaneous data collection and analysis, where constant cycling occurred through the various stages of: (i) collecting data (e.g., interviews), (ii) identifying recurrent patterns of answers in the data or codes, (iii) categorising and sub-categorising the codes, (iv) writing memos on ideas and concepts embedded in the data, and (v) determining core categories or themes (combination of codes). Through this iterative cycling process, theoretical constructs are continually refined through comparison with new examples from on-going data collection, allowing integration of new and existing data, producing a rich, well-grounded theory (Corbin & Strauss, 2008; Lingard et al., 2008).

The coding process described by Corbin and Strauss (1990, 2008) encourages the generation of categories and identifies links between them. This process facilitated the moving through levels of coding, from open to axial and finally on to selective coding. The concepts, categories, and sub categories were continually subjected to questions and comparisons, with the aim of identifying the core categories and their links with other categories. Through repeated review and comparison of interview transcripts and field notes, working with the data guided the researcher toward developing an understanding of the phenomena.

Open coding was used to identify initial level concepts, categories and sub-categories. Essentially, open coding refers to the process of generating initial concepts from data (Corbin & Strauss, 1990). Secondary analysis of data occurred though axial coding, which is the process of relating codes to each other and the identification of concepts and conceptual categories. Selective coding, the final phase of coding, involved identifying one or two core categories to which other sub-categories and categories were related. It is this network of themes, with core categories at the centre, that build a conceptual framework from which a grounded

theory is developed. Core categories were constantly modified, grouped, re-grounded, deleted, and collapsed, until a cohesive theory emerged, making sense of all the data (Strauss & Corbin, 1998). The three different forms of coding were used to analyse the data, and allowed a systematic and logical theory to be developed (Strauss & Corbin, 1998). The core category is a distinctive category, in that it is the pivotal point for the theory; most other categories relate to it, and it accounts for most of the variation in pattern and behaviour (Glaser, 1992).

Through this process of careful analysis, coding and sorting, a theory that best fits the data set was developed for both Study 1 and 2. The constant comparative techniques of grounded theory were used to compare each person's experience for similarities and differences (Corbin & Strauss, 2008). Constant comparative techniques permitted the researcher to identify properties and dimensions of these experiences, which then became categories of the data (Corbin & Strauss, 2008). These comparisons were useful to highlight different aspects of the same phenomenon and discover variations in experience or identify general patterns of experience. Constant comparative techniques were also used to ensure concepts arising from Studies 1 and 2 were grounded in the data and thus grounded in the experience of participants.

Once the theories for Studies 1 and 2 were developed, a technique of theoretical sampling was used to enable the researcher to modify the questions and the population being interviewed in order to confirm or disconfirm hypotheses and to improve understanding of the limits of the model or the theory being generated. During the process of coding, categorising, and sorting, the researcher recorded observations, thoughts, and insights regarding the possible relationship between codes and categories. These notes are called "memos". Glaser (Glaser, 1992) refers to memo-ing as "the core stage in the process of generating theory, the bedrock of theory generation" (Glaser, 1992). Memos have four basic goals: "they should develop ideas and codes, these ideas should develop freely, should be stored centrally, and they should be sortable"(Glaser, 1992). The process of coding and developing categories in grounded theory was supported by continually writing memos. When recording memos, the researcher reflected on the data but did not limit the reflection to just the data. Memo-ing has total creative freedom without rules of writing, grammar or style (Glaser, 1992). Additionally, the researcher also wrote

analytic and self-reflective memos to document and enrich the analytical process. These memos consisted of questions and speculation about the data and emerging theory.

In undertaking a grounded theory study it is the researcher's responsibility to take precautionary measures to ensure the validity of his or her research (Corbin & Strauss, 2008). Some of the measures that promote validity in a study are reflexivity, documentation, theoretical sampling, and transferability (Denzin & Lincoln, 2011). Reflexivity is the process during which the researcher carefully examines research experiences, decisions, and interpretations to allow the reader to assess to what extent the researchers interests and assumptions influenced the research (McGhee, Marland, & Atkinson, 2007). Thus, in this study, reflexivity allowed the researcher to be informed by, and build on previous knowledge gained from the literature review, without assuming that concepts discovered in the early literature review would be the only solution to a research problem (Hunter et al., 2010). Reflexivity was also used to assist in minimizing the effects of the researcher bias on the study. In being reflexive, the researcher incorporated continuous awareness of reflecting, examining and exploring her relationship with the data through all stages of the research process.

Two broad perspectives regarding the timing of the literature review in grounded theory are seen in the literature: (i) to delay the literature review until after data collection and analysis begins, and in some cases until codes and categories emerge, or (i) to undertake a preliminary literature review prior to the study (Dunne, 2011). Strauss and Corbin (Corbin & Strauss, 1990; Strauss & Corbin, 1998) also suggest the option of undertaking a general initial literature review of the area at the start of a study. They specifically acknowledge the place of personal experience, professional background, along with the literature in shaping the area of study. This view is in contrast to the completely open approach put forward by Glaser (1992), who emphasised the importance of the researcher not being influenced by previous theories. Strauss and Corbin (1998) stress the importance of acknowledging and using that knowledge to enhance theoretical sensitivity, stimulate research questions, and direct theoretical sampling. McGhee et al. (2007) concluded that the use of literature or any other a priori knowledge should not be a threat to validity if reflexivity is used to prevent prior knowledge distorting the researchers perception of

the data. Following Straus and Corbin's (Corbin & Strauss, 1990; Strauss & Corbin, 1998) guidelines, an initial literature review was conducted to contextualize the program of study, identify knowledge gaps, and develop theoretical sensitivity. In addition, this process was necessary in order to meet University Regulation requirements (Stage II, Ethics and Confirmation), provide a rationale for the study, and stimulate research questions.

For this study, as well as an initial review of literature, the researcher brings experience and knowledge related to the field of study through her work as a psychologist in the area of bariatric surgery. Although this experience and knowledge leads to unavoidable preconceptions, this experience creates opportunity for enhanced creativity, theoretical sensitivity, and rigour. Further, in order to reduce any bias that could potentially distort data analysis as a result of these prior experiences, and from the initial literature review, the researcher examined these reflexively. Through this process, she openly acknowledged the influence of previous work experience and continued to examine her perspective of what was emerging from her own data. Thus, prior experience and the preliminary literature review used reflexively has contributed to the grounded theory research (Hunter et al., 2010).

The research interview as part of the qualitative research process, is a complex social interaction that has the potential to influence, or be influenced by, both the researcher and the participant (Jack, 2008). When a researcher is identified as a psychologist or health professional, the identification of this role has the potential to influence the researcher-participant interaction (Jack, 2008). The program of research was conducted in keeping with the epistemological perspectives of the researcher. In order to minimize the influence of the researcher's role and to be cognizant of boundary role violation in the qualitative interviews, an initial recruitment flyer was distributed by the clinics and an informed consent document provided. In the information flyer it was noted that, if patients agreed to participate, they could withdraw from participation at any time during the project without comment or penalty. Further, it was clarified to the research participants in the informed consent document that their participation in the project was entirely voluntary and their decision to participate or not participate would in no way impact upon their current or future relationship with the researcher's university or their clinic. Further, it was

stated that participants did not have to complete any question(s) in the interview that they were uncomfortable answering. Additionally, participants were informed that the university provides for limited free counselling for research participants who may experience discomfort or distress as a result of their participation in the research.

According to qualitative research methods recommendations, data saturation is reached when there is enough information to replicate the study, when the ability to obtain additional new information is attained, and when further coding is no longer feasible (O'Reilly & Parker, 2013). However, the concept of saturation has received criticism and has a number of practical weaknesses, especially as in some cases the number of emergent themes are potentially limitless (Green & Thorogood, 2004). This potential weakness is because each individual person is unique and, in this sense, data are never truly saturated as there will always be new things to discover (Green & Thorogood, 2004). However, in grounded theory the notion of saturation does not refer to the point at which no new ideas emerge, but rather indicates that categories are fully accounted for, the variability between them are explained and the relationships between them are tested and validated and thus a theory grounded in the data can emerge (Green & Thorogood, 2004). This concept is congruent with the underpinning epistemological position and the aims of grounded theory which are to develop an explanatory theory of the social processes that are studied in the environments in which they have taken place (Glaser, 1992). The approach taken in the qualitative studies of Study 1 and 2 followed the grounded theory notion that all categories were accounted for and the variability between the categories explained and the relationships were tested and validated and the theory emerged was grounded in the data. Thus, data saturation was about the richness and depth of the data and not related to the number of participants in the studies.

In grounded theory, the process of theoretical sampling combined with the constant comparative method is another important strategy to promote validity (Glaser, 1992). Taylor and Bogdan (1984) explain that theoretical sampling is a procedure of selecting additional cases to be studied to gather new insights or expand and refine concepts already gained. Theoretical sampling is often used in conjunction with the three levels of coding as described by Corbin and Strauss (2008). Additional interviews were arranged and conducted in the later stages of the study wherein emerging codes were presented to participants to extend upon and redefine the theory

in Studies 1 and 2. The theory of each study was further refined and tested by utilising disconfirming evidence and negative case analysis. Through theoretical sampling, the researcher modified the questions and the sample population being interviewed in both studies in order to confirm or disconfirm emerging hypotheses and to improve understanding of the limits of the emerging theory. A supervisory team assisted throughout the data analysis phase to ensure the validity of the data by challenging ideas and discussing interpretation of codes and categories and the building of the theory. These processes contributed to the inductive and deductive processes that are critical to building a theoretical model that is grounded in the data from the patients' perspectives.

This program of research aimed to develop a theory in each study to explain the contribution of psychosocial factors to the success or failure of patients to achieve excess weight loss (EWL) following revisional and following multiple revisional bariatric surgery. In exploring which qualitative methodology was the most appropriate fit for this program of research, grounded theory, as described by Corbin and Strauss (2008), was chosen for data analysis for Study 1 and Study 2 because it provides a systematic approach for building useful theories by applying analytic tools to organize raw data (Strauss & Corbin, 1998). Grounded theory was selected after consideration was given to the research questions and goals of the studies to (i) provide the patients' perspective on the experience of failing to achieving EWL which is not reported in the current literature, (ii) avoid researchers' preconceived ideas about potential outcomes, and (iii) develop a model (or models) for the quantitative study.

Thus, both qualitative studies utilised Grounded Theory to generate theories explaining weight loss failure(s) through an inductive examination of the data rather than a deductive approach. The process involved a systematic process of gathering, analysing, and conceptualising qualitative data with the primary aim of developing a coherent theory that became evident from and was grounded in the data (Corbin & Strauss, 2014). This method was appropriate for these studies as it aimed to identify emergent themes and their interrelations and build meaningful, comprehensive theories of the patients' perceptions of the factors that contributed to electing to have revisional bariatric surgery or surgeries after not achieving EWL post-LAGB.

Quantitative Method - Phase 2

In contrast to qualitative research, the quantitative research approach has been the dominant paradigm in psychology and involves confirmation or falsification of prior theory. Qualitative research places an emphasis on deduction, confirmation, explanation, prediction, and theory and hypothesis testing (Henwood & Pidgeon, 1992). Quantitative research methods are particularly useful in testing hypothesised associations or causal relationships between phenomena, thereby verifying earlier theories, assumptions and conclusions (Henwood & Pidgeon, 1992). Quantitative methods rely on the use of standardised measuring instruments which transform human experience to observable, manipulable, and measurable variables (Henwood & Pidgeon, 1992). Consequently, the findings of quantitative research are able to be generalised and replicated. Study 3 utilised a longitudinal design to explore the beliefs and experiences of primary bariatric surgery patients and find out more information regarding their psychosocial presentation. The aim of the quantitative study was to empirically test the models developed from the two previous qualitative studies. Specifically, Study 3 involved a longitudinal online survey to measure the experiences and behaviours of patients within 4 to 6 weeks following primary bariatric surgery. This time frame was identified as being important as bariatric patients would have recovered physically from the surgery, mostly returned to usual work activities, and importantly would be able to eat and drink a normal diet. At this time, it is only the portion size of food that is able to be eaten that is restricted, not the variety of foods. The second time point was chosen as the majority of the weight loss typically occurs in the first 6 months post-bariatric surgery. Manning et al. (2015) identified patients who ultimately experienced suboptimal weight loss after either LSG or RYGB based on early postoperative weight loss, within the first 6 postoperative months. Thus, the times frames in the longitudinal study were identified as being important in order to examine how these factors contributed to the participants achieving a poorer than expected weight loss outcome over a 6 month follow-up period, as defined by the changes in Body Mass Index (BMI). The variables measured at Time 1 were based upon the concepts generated from the first two qualitative studies and included: social support, activity levels, locus of control, changes in perception of taste, emotional eating, eating behaviours, mental health and food cravings. Validated measures of the elicited constructs were employed in

the quantitative study. For one construct, an appropriate validated measure was not available and, thus, a measure was developed to investigate this construct.

The longitudinal study investigated whether these factors (as described above) predicted early poorer weight loss outcomes post-LSG. Interpersonal trauma was identified as an important construct in the qualitative Study 2 but was not investigated as a predictor variable given the design of the study in that an online survey was not deemed appropriate given the sensitive nature of the construct.

3.3 RESEARCH DESIGN

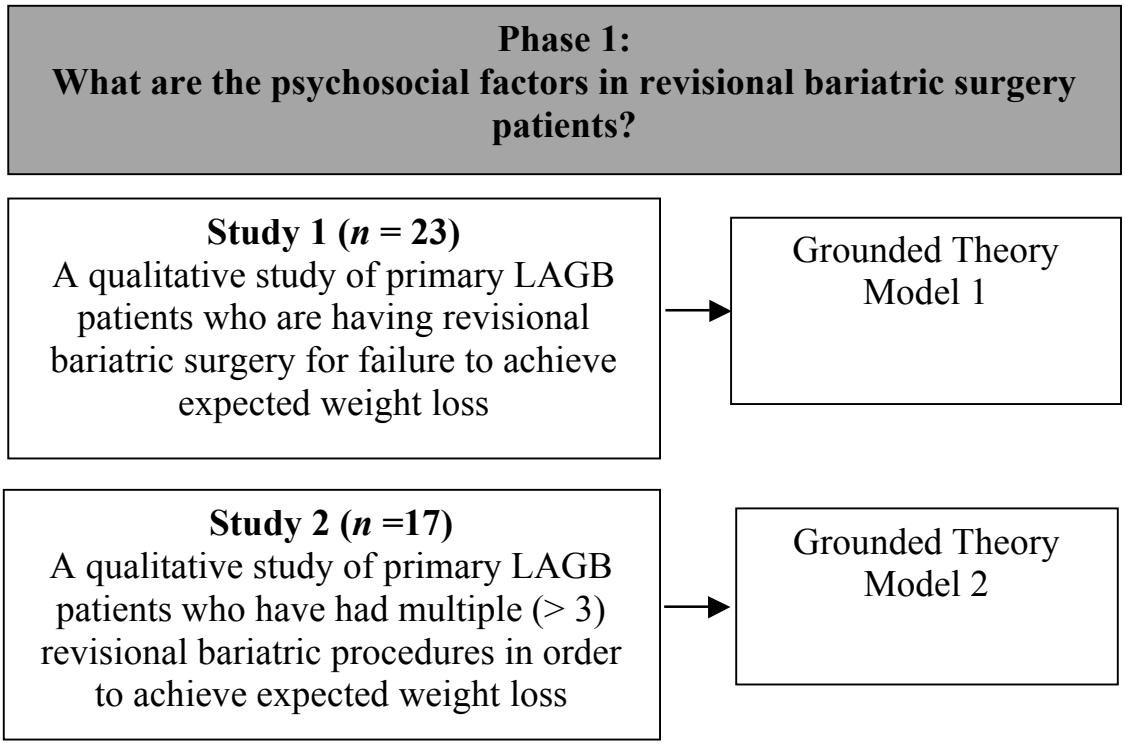


Figure 3.1. Model of phase 1 of the program of research

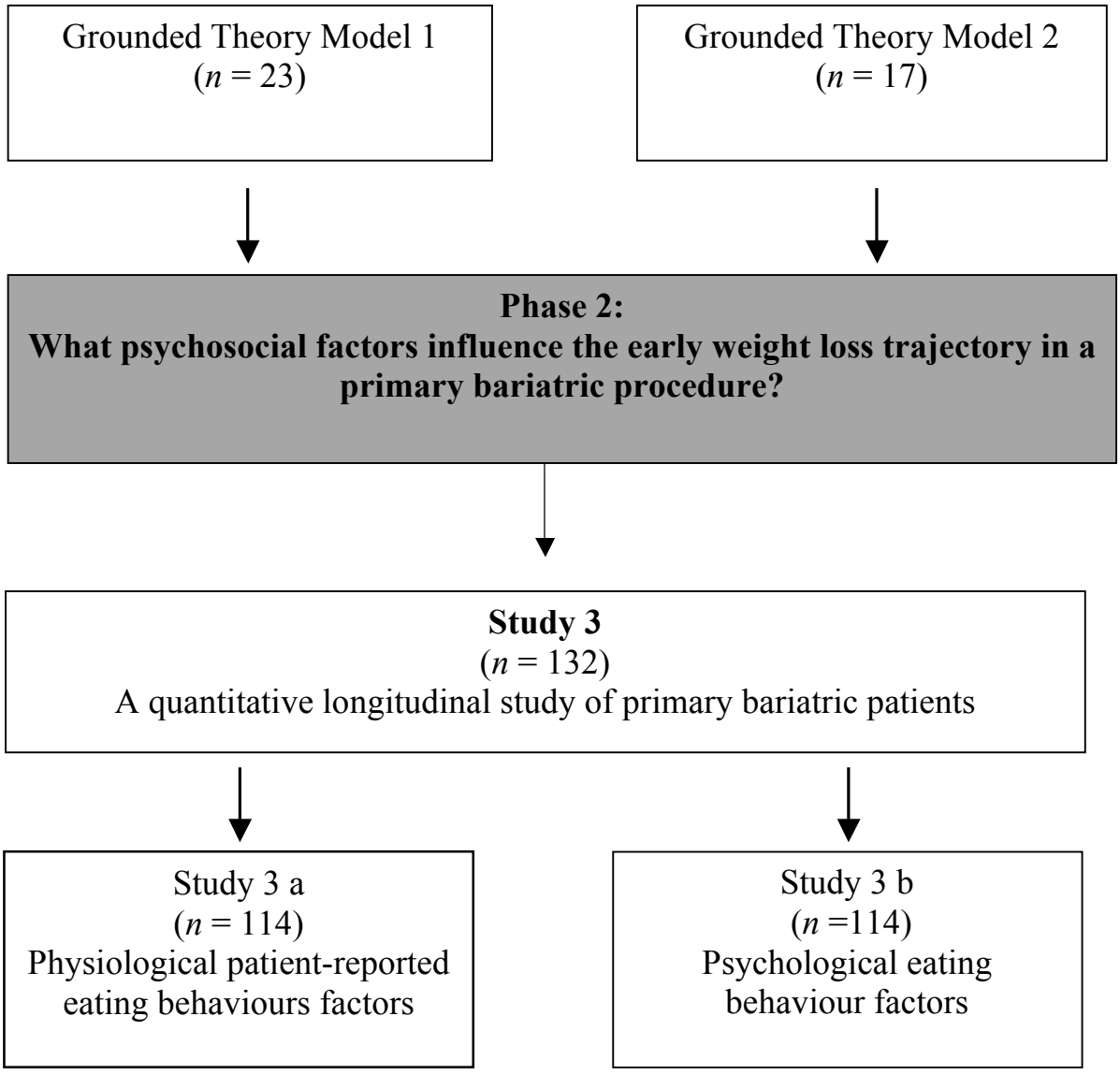


Figure 3.2. Model of phase 2 of the program of research

3.4 PARTICIPANTS

Participants for Study 1 and Study 2, included adults aged 18 years and over and they were recruited from two bariatric surgery practices. A total of 23 participants (18 females and 5 males) were included in Study 1 based upon the following criteria: they had previous Laparoscopic adjustable band (LAGB); had failed to achieve excess weight loss outcome (< 50% of EWL); and they had recently undergone revisional bariatric surgery. The average time elapsed since LAGB implantation for the participants was 4 years. The participants in both Studies 1 and 2 were from the same ethic background and identified as being Caucasian.

Study 2 involved 17 female participants and each of them had experienced a primary failed LAGB and had subsequently elected to have more than one revisional

procedure. The participants in Study 2 are a unique cohort, as a limited number of bariatric patients elect to have multiple procedures to remediate not achieving weight loss expectation. Further, bariatric surgery is expensive and revisional surgery has higher complication rates and an increased risk of mortality compared to primary bariatric procedures.

The quantitative study (Study 3) recruited 132 potential participants from four clinical sites. All of the participants were over 18 years of age and had elected to have a primary bariatric procedure. In response to the invitation to participate, the study had an 88.4% response rate, with 114 participants completing the online survey at 6 to 8 months post-operatively. The program G Power was used to calculate the minimum sample size required using an alpha at 0.05 and a power at 0.95. After identifying effect sizes from the planned measures based upon previous studies, the statistical power analysis calculation demonstrated that approximately 112 participants should be included. In this study, the majority of the 132 participants were female (n = 113) and most (n = 106) participants underwent a LSG. Three participants underwent a LAGB and five participants elected for a RYGB. Results of the LAGB and RYGB participants were excluded in order to examine the constructs identified in the prior qualitative studies in a cohort of patients undergoing the same type of weight loss surgery, yielding a total sample size of 106. Thus, although Study 3 had 114 participants in total, it was not adequately powered when only examining the LSG participants. However, it was considered important to investigate only the LSG patients as the LSG is the most common primary bariatric procedure now performed in the four participating clinics.

The greater majority of the participants in all three studies were women, congruent with prior studies indicating that women struggling with obesity are significantly more likely to seek treatment for obesity and elect to have bariatric surgery (Mahony, 2008; Sarwer, Wadden, & Fabricatore, 2005). Across the three studies, a total of 19 participants were male. These results are consistent with clinical practice with significantly more women presenting to discuss primary bariatric surgery and pursue revisional and multiple revisional bariatric surgery for inadequate weight loss or weight regain. However, according to a recent study, men would benefit significantly more from undergoing bariatric surgery as, when they do present for surgery, they are older, with more advanced obesity, and with more

complicated comorbidities (Farinholt, Carr, Chang, & Ali, 2013). In a longitudinal study conducted from 1998 to 2010 of 190,705 patients who underwent bariatric surgery (93% gastric bypass, 7% sleeve gastrectomy), only 19.64% were male. The study concluded that the unequal gender distribution in bariatric surgery patients is influenced by demographic and socioeconomic factors (Fuchs et al., 2015). This disparity decreased in patients who were older and had more comorbidities whereas the disparity increased for certain races and lower incomes (Fuchs et al., 2015). Therefore, future studies should investigate the barriers that men experience in seeking surgical intervention for obesity.

3.5 PROCEDURE AND TIMELINE

For Studies 1 and 2 potential participants were given information flyers by dieticians, nurses, and surgeons at the two bariatric surgery clinics. Interested individuals contacted the researcher, who is the primary psychologist at both practices, and the study was explained, and an appointment made. At this appointment, the participants signed consent forms and were informed that the interview would be audiotaped. For Study 2 face to face interviews lasted between 60 and 90 minutes and included open ended questions. For Study 1, 20 interviews were conducted face to face and three interviews were conducted via Skype. These Skype interviews were conducted as the participants were unable to travel from regional Queensland for the interviews. A variation in Ethics approval was obtained to conduct these Skype interviews. Interviews were considered appropriate due to the sensitive nature of exploring weight difficulties and complex reasons for experiencing failure to achieve EWL post-LAGB. During the informed consent process, it was clarified to patients that if they agreed to participate they did not have to respond to any question(s) that they were uncomfortable answering and a notification was given that participants may experience discomfort when discussing their weight loss history. In response to this possibility, participants were informed that the researcher's university provides for limited free counselling for research participants who may experience discomfort or distress as a result of their participation in the research. Participants were provided with AUD $50 movie vouchers for participating in the study.

In Study 3, the dieticians, nurses, or surgeons at four respective bariatric surgeries gave flyers to potential participants. If the person was interested in

participating, they then contacted the researcher and the study was explained. If the participant was willing to participate, the researcher then assigned a code to the participant, obtained their email address, and retrieved the additional data such as BMI from the participants' medical records held at the respective clinics. A link was then emailed to the participants via Key Survey, an online survey tool. Informed consent to access medical records was obtained through the online survey. After 6 months further measures were sent out, again via Key Survey with a unique link provided to the online survey to enable results from both studies to be linked. Participants were requested to provide their postal address in order to receive an AUD $20 movie voucher. The participants completed the online measures, which took up to 45 minutes to complete at both Time 1 and again at Time 2. Participants were asked to report their weight at 6 months' post-surgery. Participants were informed that there was a small risk of feeling inconvenienced in having to complete the questionnaires. In the process of gaining informed consent, participants were informed that there was a low probability of slight emotional discomfort associated with answering questions about their experiences with bariatric surgery and that this discomfort was likely to be similar to their normal day-to-day experiences associated with living with obesity. Through the informed consent process, it was clarified to participants, that, if they agreed to participate, they did not have to complete any question(s) that they were uncomfortable answering. Additionally, they were informed that the researcher's university provides for limited free counselling for research participants who may experience discomfort or distress as a result of their participation in this research.

3.6 MEASURES FOR STUDY 1 AND 2

In qualitative Studies 1 and 2, the quantitative measures below were included as descriptive measures only, to provide more objective measures of the degree of depression, anxiety and stress, and psychosocial functioning (i.e. social acceptance, self-efficacy regarding eating and weight control and intimacy. These descriptive measures were included to help other researchers better understand the characteristics of the sample and so better understand the representativeness of the samples and the generalisability of the findings. The participants were requested to provide demographic data (see Appendix A). Copies of quantitative measures are

presented in Appendices B and C. Body Mass Index (BMI) obtained from medical records held at respective sites.

3.6.1 The Depression and Anxiety and Stress scale (DASS - 21)

The DASS - 21 was utilised to assess the levels of depression, anxiety, and stress in the participants. The DASS - 21 is a set of three self-report scales designed to measure the negative emotional states of depression, anxiety, and stress (Lovibond & Lovibond, 1995). Each of the three DASS - 21 scales contains 14 items, divided into subscales of 2-5 items with similar content. The depression scale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement, anhedonia, and inertia (Lovibond & Lovibond, 1995). The anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect (Lovibond & Lovibond, 1995). The Stress scale is sensitive to levels of chronic non-specific arousal. It assesses difficulty relaxing, nervous arousal, and being easily upset/agitated, irritable/over-reactive, and impatient (Lovibond & Lovibond, 1995). Participants are asked to use 4-point severity/frequency scales to rate the extent to which they have experienced each state over the past week (Lovibond & Lovibond, 1995). Scores for Depression, Anxiety, and Stress are calculated by summing the scores for the relevant items (Lovibond & Lovibond, 1995). The scales of the DASS - 21 have been shown to have high internal consistency with Cronbach's alphas for the subscales: .94 for Depression, .87 for Anxiety, and .91 for Stress (Szabo, 2010). The DASS-21 possess satisfactory psychometric properties and the factor structure was substantiated both by exploratory and confirmatory factor analysis (Lovibond & Lovibond, 1995).

3.6.2 The Obesity Psychosocial State Questionnaire (OPSQ)

The Obesity Psycho-social State Questionnaire was utilized for assessing psychosocial functioning as descriptive data. The questionnaire measures seven domains: physical functioning (15 items), mental well-being (six items) physical appearance (nine items), social acceptance (four items) self-efficacy toward eating and weight control (three items), intimacy (four items) and social network (two items). All scales have a moderate to high reliability. The questionnaire has a five-point rating scale, ranging from 1 (*almost never*) to 5 (*almost always*). A lower score on a psychosocial state reflects less problems on that domain. The psychometric

properties of the OPSQ established in a sample of 287 patients before and after surgical or dietary intervention in obese patients are satisfactory (Larsen & Geenen, 2005).

3.6.3 Demographic Information

Participants were asked to provide demographic information regarding their: age, gender, cultural background they identified with, relationship status, level of education, current employment status, occupation, type of employment, and number of hours worked per week.

3.6.4 Semi Structured Interviews

Studies 1 and 2 used semi structured interviews which evolved as data collection progressed. The initial questions used in the interviews for Study 1 and for Study 2 are detailed in Appendix D.

3.7 MEASURES FOR STUDY 3

For the longitudinal study, Study 3 included the quantitative measures below as these constructs were, identified as important in the qualitative studies Study 1 and 2 and were chosen with reference to existing constructs in this field of research. These measures were chosen to provide objective measures of: locus of control, eating behaviours, food cravings, mental health, perceived social support, activity levels, perception of taste and desire and enjoyment changes and quality of alimentation. Table 3.1 lists the constructs elicited from the qualitative studies and the measures which were chosen with reference to existing constructs in this field of research, to investigate these constructs in the quantitative stage of investigation.

Table 3.1: Measures for Study 3

Measure	No of Items	Constructs from qualitative Studies 1 and 2	Qualitative Construct	Factors
Internal versus External control of weight scale	5	Unrealistic expectations of weight loss surgery Study 1 and 2	The degree to which respondents consider the achievement of a goal contingent or non contingent on their own behaviour	External vs. Internal locus of control

The 2 Way Social Support Scale	11	Not able to eat out socially Study 1 Lack of social engagement Lack of perceived emotional and family support Study 2	Level of Emotional/social support	Receiving emotional support Receiving Instrumental support
Baecke Physical Activity Scale	16	Physical activity Not identified by participants in Study 1and 2		Physical activity at work Other physical activity during leisure time that excludes sport
Changes in Taste Desire and Enjoyment Scale Questionnaire	9	Desire for taste of high calorie foods Study 1	Change in taste Change in desire for foods Change in enjoyment of food	
Food cravings questionnaire-Trait	39	Eating because of emotional reasons Study 2 Food choices that give reward Study 1	Eating for emotional reasons Loss of control over eating Food choices that give reward Food as an addiction Cravings for food	Intentions to consume food Anticipation of positive reinforcement Relief from negative states, lack of control over eating, preoccupation with food, hunger, emotions, cues that trigger cravings, and guilt
Body Mass Index		Increase in weight/not achieving %EWL %TWL	Change in weight	
Mental Health Inventory-5	5	General Mental Health		Mental health dimensions: anxiety, depression, psychological well-being
The Three Factor Eating Questionnaire Revised	3	Eating in response to emotional distress		Emotional eating
Quality of alimentation questionnaire		Satisfaction with eating		Satisfaction with eating behaviour

The participants were requested to provide demographic data (see Appendix A). Copies of quantitative measures are presented in Appendices F – J. Body Mass Index (BMI) obtained from medical records held at respective sites.

3.7.1 The Food Cravings Questionnaire - Trait Version (FCQ-T)

The Food Cravings Questionnaire - Trait Version (FCQ-T; Cepeda-Benito et al., 2000) is a 39-item self report questionnaire designed to assess stable features of food cravings among individuals and includes physiological and psychological variables. Responses are recorded on six-point Likert scales ranging from 1 (*never*) to 6 (*always*). The FCQ-T measures nine dimensions of food cravings found in the research literature including, (i) an intention and planning to consume food (α = .81); (ii) anticipation of positive reinforcement that may result from eating (α = .85); (iii) anticipation of relief from negative states and feelings as a result of eating (α = .81); (iv) possible lack of control over eating if food is eaten (α = .92); (v) thoughts or preoccupation with food (α = .93); (vi) craving as a physiological state (α = .76); (vii) emotions that may be experienced before or during food cravings or eating (α = .91); (viii) environmental cues that may trigger food cravings (α = .86); and (ix) guilt that may be experienced as a result of cravings and/or giving into them (α =.79). The overall scale has been shown to have a high internal consistency (Cronbach's α = .92), the sub-scales also demonstrate high levels of consistency (Cepeda-Benito et al., 2000; Crowley et al., 2012). In addition, the test-retest reliability was satisfactory and an analysis of the construct validity generally revealed the expected results. The FCQ-T has been validated on a bariatric surgery population (Crowley et al., 2012), making it a suitable measure for this study.

3.7.2 The Baecke Physical Activity Questionnaire

The Baecke Physical Activity Questionnaire (Baecke, Burema, & Firjters, 1982), has a total of 16 questions classified into three domains: work, sports, and non-sports leisure activity. Each domain has several questions scored on a five-point Likert scale, ranging from *never* to *always or very often*, in the past year. Repeatability after 5 and 11 months was good, with test-retest correlation coefficients between r = .65 and r = .89 for main sections of the questionnaire. The percentages of agreement, exceeding chance (Cohen's kappa) were 57% and 56% for men (at 5 and 11 months

respectively) and 41% and 46% for women. Agreement apart from chance between classification in tertiles for both methods was 35% for men and 10% for women. These data show that repeatability is good and relative validity as compared to an activity diary is moderate but well within the range of values found in other studies (Pols et al., 1995)

3.7.3 Internal versus External control of weight scale (IECW)

The purpose of the IECW (Tobias & MacDonald, 1977) is to measure a person's locus of control pertaining to weight loss. The 5-item IECW is similar to other measures of locus of control in that it attempts to measure the degree to which a respondent considers achievement of a goal as contingent or non contingent on their own behaviour. The scale was initially developed to test the effectiveness of internal perception to facilitate weight reduction. The instrument is relevant to weight reduction treatment in that it emphasises clients taking responsibility for their treatment. While the IECW registers change toward an internal control orientation as a consequence of experimental manipulation, the perceived responsibility itself is insufficient to facilitate weight loss. Consequently, the IECW needs to be used along with other measures of treatment effectiveness. Items are arranged in forced choice format, one alternative reflects an internal orientation and the other reflects an external orientation. The reliability of the IECW is acceptable with a correlation coefficient of r =.52 (Corcoran & Fischer, 1987).

3.7.4 Mental Health Inventory – 5 (MHI-5)

The MHI-5 (Berwick et al., 1991) is a brief questionnaire to assess mental health and consists of five items. It is scored on a five-point Likert-type scale. The internal consistency of the MHI-5 is satisfactory with a Cronbach's alpha of .88 (Rumpf, Meyer, Hapke, & John, 2001). The MHI-5 is psychometrically sound, easy to complete and valid in different subgroups and across various cultures.

3.7.5 The 2-Way Social Support Scale (2-Way SSS)

The 2-Way SSS (Shakespeare-Finch & Obst, 2011) is a measure of social support that assesses giving and receiving instrumental and emotional social support. The 20-item inventory is comprised of four factors and is responded to on a 6 point Likert scale with 0 corresponding to *not at all true for me* and 5 indicating the

statement is *always true*. Higher scores indicate higher levels of giving or receiving social support. The scale has been subject to exploratory and confirmatory factor analyses in different populations with results supporting a four factor solution. Reliability coefficients ranging from α = .81 to α = .92 for the four factors also provide support for the internal consistency of the scale (Shakespeare-Finch & Obst, 2011). The 2-Way SSS has also been used as a two factor scale, assessing receiving and giving social support with both factors including items pertaining to instrumental and emotional support. The two factor scale has also demonstrated good reliability (giving α = .86 and receiving α = .95; Shakespeare-Finch & Obst, 2011).

3.7.6 The Three Factor Eating Questionnaire Revised (TFEQ-R18)

The TFEQ-R18 (Karlsson, Persson, Sjöström, & Sullivan, 2000) consists of 18 items on a 4-point response scale (*definitely true* - *mostly true* - *mostly false* - *definitely false*). Responses to each of the 18 items are given a score between 1 and 4 and item scores are summated into scale scores for cognitive restraint, uncontrolled eating, and emotional eating. Higher scores in the respective scales are indicative of greater cognitive restraint as well as uncontrolled and emotional eating. Only the emotional eating scale, composed of items 3, 6, and 10 was utilised in this study. The Emotional Eating factor can be considered a freestanding measure (Karlsson et al., 2000).

3.7.7 Taste Desire and Enjoyment Scale Questionnaire (TDESQ)

The TDESQ was developed to investigate taste desire and enjoyment of flavours post-bariatric surgery as no suitable measure was available. The TDESQ questionnaire consists of 24 questions with a Likert scale that ranged from 1 to 5 (see Appendix I). The TDESQ provides an indication of the degree that tastes, desires, and enjoyment for certain foods or liquids have changed or stayed the same since undergoing bariatric surgery. Prior to the start of Study 3, the TDECQ questionnaire was reviewed by educational and health professionals for content and readability and revised as recommended. In addition, the revised questionnaire was pilot tested with a sample of 10 bariatric patients to test for content validity.

3.7.8 Quality of Alimentation Questionnaire

Suter et al.'s (Suter, Calmes, Paroz, & Giusti, 2007) Quality of Alimentation questionnaire is a recognised tool for assessing food tolerance in bariatric patients and was used to evaluate the overall patient satisfaction regarding the quality of alimentation. The questionnaire is divided into three sections and cumulatively provides a total score of food tolerance (1 to 27), where 1 is indicative of extremely poor quality of eating and a score of 27 maximal food tolerance. Section 1 assesses satisfaction with current ability to consume food, with a score range from 1 (*very poor*) up to 5 (*excellent*). Suter et al. (2007), in developing this questionnaire, administered it to a group of 75 non-obese volunteers for validation in the normal population and to a group of 55 non bariatric morbidly obese patients.

3.7.9 Body Mass Index (BMI)

Median Body Mass Index (BMI) is a key index for relating body weight to height by dividing a person's weight in kilograms (kg) by their height in meters (m) squared. All participants had a BMI that was documented on the day of the primary procedure in their medical records. These medical records are kept at the respective Clinics. Consent was obtained to access these records when participants agreed to partake in the study. Participants were asked to report their weight and height at 6 months post-LSG surgery.

3.8 ANALYSIS

Phase 1 – Grounded theory

In Phase 1 of this research which comprised of study 1and 2, each interview was audiotaped, transcribed, and coded by the primary researcher. NVivo 10, a qualitative data software package produced by QSR International was utilised to organise the data. The initial line-by-line analysis was undertaken in order to identify words and phrases relevant to the phenomenon being studied and to the participant story (Corbin & Strauss, 2008). The initial data analysis occurred at a descriptive level and encompassed re-reading the transcribed transcripts a number of times and espousing the language of the participants to create open codes (Corbin & Strauss, 2008). The initial open coding through this manual analysis of the transcribed interview data generated a significant number of similar words or terms with a vast

number of codes. Related codes were grouped into categories and relationships between these categories were examined utilising axial coding. This secondary analysis of data occurred at abstract conceptual levels, by relating codes to each other and the identification of concepts and conceptual categories. Corbin and Strauss (2008, p.198) describe the open and axial coding as occurring "hand in hand". Therefore, axial coding was undertaken through iterations at increasingly abstract conceptual levels and applied Strauss's coding paradigm (Corbin & Strauss, 2008). An example of open coding, axial coding and selective coding from Study 1 is presented in Appendix L. Constant comparative techniques identified patterns and portrayed these as conceptual representations that added to understanding the experience of the phenomenon being studied (Corbin & Strauss, 2008). In Study 1, five conceptual categories were identified and in Study 2, 11 conceptual categories were identified. The concepts, categories and sub categories were continually subjected to questions and comparisons, with the aim of identifying the core categories and their links with other categories. Through repeated review and comparison of the interview transcripts and field notes, working with the data guided the researcher toward developing an understanding of the phenomena. Data collection and analysis were done simultaneously for both study 1 and 2.

Through selective coding, in the final phase of coding, "Unrealistic expectations of weight loss surgery" was identified as the core category in both Study 1 and 2. These are the categories which other sub-categories and categories were related to and which tied all the concepts together. An inventory of codes with their descriptions was kept in a codebook and NVivo 10 was utilised to store the memos on the (1) process of coding and (2) theoretical codes. Field notes, containing observations made by the researcher during interviews, were kept in NVivo memos. An example of a memo from Study 1 is presented in Appendix M. Data collection continued in both studies 1 and 2, until all categories were accounted for and the variability between the categories explained and the relationships were tested and validated and the theory emerged was grounded in the data. Emerging codes were presented to participants in the study's later stages to extend upon and redefine the theory. The theory in each study respectively, was further refined and tested by utilising disconfirming evidence and negative case analysis. A working model was developed by utilising the conceptual categories explicated from Phase 1 of the

program of research and then relating these categories to the broader literature and involved the processes of comparing, contrasting, and abductive reasoning. The constructs elicited from the working model informed the choice of the variables and the respective measures to represent the constructs in the quantitative stage of investigation.

Through theoretical sampling, the researcher modified the questions and the sample population being interviewed in both Study 1 and 2 respectively, to confirm or disconfirm emerging hypotheses and to improve understanding of the limits of the emerging theories. A supervisory team assisted throughout the data analysis phase of both Study 1 and 2, to ensure the validity of the data by challenging ideas and discussing interpretation of codes, categories and theory building. In study 1 and 2, reflexivity allowed the researcher to be informed by, and build on previous knowledge gained from the literature review, without assuming that concepts discovered in the early literature review would be the only solution to a research problem (Hunter et al., 2010). Reflexivity was also used to assist in minimizing the effects of the researcher bias on the studies. In being reflexive, the researcher incorporated continuous awareness of reflecting, examining and exploring her relationship with the data through all stages of the research process. These strategies contributed to the inductive and deductive processes critical to building a theoretical model for both studies 1 and 2, grounded in the data from the participants' perspectives.

The following Figure 3.3, provides a basic representation of the data collection and analysis process undertaken in Phase 1 of this program of research. However, it it is important to note that although interviews, data collection and data analysis are identified separately, data collection and analysis were done simultaneously and have a reciprocal relationship with each other.

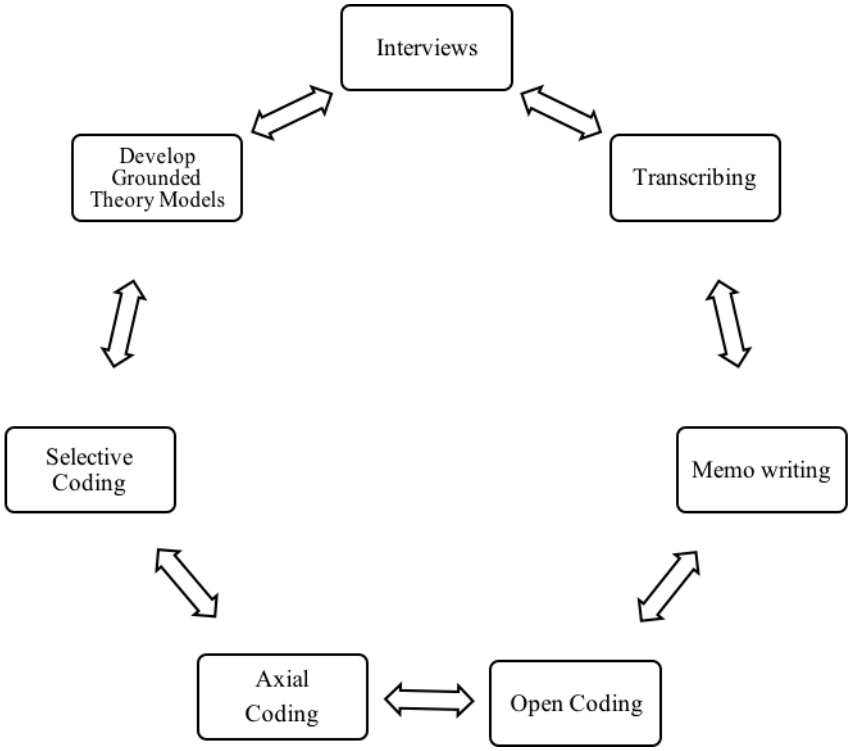


Figure 3.3. Basic representation of Grounded Theory data collection and analysis (Phase 1- Study 1and Study 2)

Phase 2 - Quantitative Method

All quantitative analyses were undertaken with SPSS 23.0. Specific analytic techniques utilised are described in the methods section of each of the papers.

3.9 PROGRAM OF RESEARCH

3.9.1 Study 1

The purpose of this first study was to identify from patients' (N = 23) perspectives what contributed to not achieving EWL from a primary LAGB procedure and led to them seeking revisional surgery. Data were analysed from a grounded theory methodology in order to build a causal model.

3.9.2 Study 2

The second study in the program of research examined what contributed to not achieving expected weight loss outcome from a primary Laparoscopic adjustable band (LAGB) surgery and led to subsequent multiple revisional bariatric surgeries.

The sample in this study were all female (N = 17) and had had more than three revisional weight loss surgery procedures. The qualitative data were then analysed using grounded theory methodology.

3.9.3 Study 3a

Study 3, a quantitative study, applied findings from Studies 1 and 2 to test the constructs in the causal models aiming to identify the psychosocial factors that predicted patients' early weight loss trajectories in a Laparoscopic sleeve gastrectomy (LSG). Although 132 participants initially took part in the study, 114 participants completed the survey at both times. However, eight participants were excluded as they had a primary LAGB or RYGB. The participant demographics are reflective of the proportions of bariatric procedures being performed with the LSG procedure now being the most popular procedure being performed worldwide and also in Australia. This manuscript examined the patient-reported physiological factors related to eating behaviour post-primary bariatric surgery. The constructs of satisfaction with eating behaviour and changes in taste perception, desire, and enjoyment of food were identified in the qualitative studies as important psychosocial determinates contributing to not achieving a satisfactory weight loss outcome post-bariatric surgery. Therefore, this study investigated changes in taste perception, desire, and enjoyment of flavours changes post-LSG, which may impact on palatability and food preferences and, thus, result in greater weight loss in the longer-term.

3.9.4 Study 3b

Findings from grounded theory models developed in Studies 1 and 2 were applied to identify the psychosocial factors that predicted patients' early weight loss trajectories following primary bariatric procedures. A total of 106 participants' data were included in this study. This manuscript examined the psychological factors influencing eating behaviour post-primary bariatric surgery. The quantitative measures were chosen to provide objective measures of: eating behaviours and food cravings as these constructs were identified as important in the qualitative studies. The eating behaviour constructs identified in the qualitative studies were multifactorial and, thus, examining these constructs with the multidimensional

questionnaire such as the FCQ–T was important as it investigated eating behaviours that were not disordered in nature but may be associated with a range of negative eating-related choices post-operatively in bariatric surgery patients. Thus, all the nine dimensions of the FCQ–T: intentions to consume food, anticipation of positive reinforcement, relief from negative states, lack of control over eating, preoccupation with food, hunger, emotions, cues that trigger cravings, and guilt were included. However, the constructs lack of control over eating, and emotions that trigger eating on the FCQ-T did reach statistical significance. Consequently, this longitudinal study reported on the impact of psychological factors such as food cravings that influence eating behaviours in LSG patients with poorer weight loss outcomes at 6 months. The aim was to investigate negative eating-related choices in those participants on a lower weight loss trajectory who consequently may be at-risk for not achieving expected weight loss outcome in the longer-term.

3.10 ETHICS AND WORKPLACE HEALTH AND SAFETY

The Human Research Ethics Committee of Queensland University of Technology approved this research. A National Ethics Application Form (NEAF) was submitted for review on the 18 May 2011, and the student was approved for data collection for Study One and Two and a variation was approved on 12 August 2014(QUT-HREC #1200000 250). Ethics approval for Study 3 was obtained on 30 September 2014(QUT-HREC #1400000718). A university Workplace Health and Safety proposal was obtained which is aimed at minimising risk to the researcher. Permission was obtained from the surgeons in respective clinics for their patients to participate in the studies and to conduct the interviews for Studies 1 and 2 in their professional rooms.

Chapter 4: Study 1

The purpose of this manuscript in the thesis was to ascertain the psychosocial factors that patients identified from their own individual perspectives that had contributed to them not achieving an expected weight loss outcome following a primary LAGB and led them to thus seeking a revisional bariatric surgery to remediate their failed primary surgery. Participants were recruited from two bariatric surgery practices. The majority of the sample underwent a RYGB as a revisional procedure and a small minority (n = 3) underwent an LSG. The LSG participants underwent a two-stage procedure in that the LAGB was removed and three months later a LSG was performed. Participants were asked about why they were considering a revisional procedure, the factors that they felt had contributed to the primary LAGB process being unsuccessful, how the experience of LAGB failure had affected them emotionally, and the challenges they felt they were still facing. In addition, participants were asked about their current relationship with food. The interview data was then analysed using grounded theory methodology. Participants reported that they found the experience of telling their weight loss journey story cathartic and that they were really pleased that this area was being researched as they had often felt isolated in their experience of failure.

This manuscript has been published in *Journal of Clinical Obesity*. It is indexed in PubMed/Medline and Embase and published by the major scholarly publishing house of Wiley Blackwell. It does not have an impact factor as yet, having commenced publication in 2011.

Publication title: Psychosocial Presentation of Revisional LAGB Patients: A Qualitative Study

Authors: Michele Janse Van Vuuren, Esben Strodl, Katherine White, and Philip Lockie

Publication date of publication: Published by *Clinical Obesity*

Statement of Contribution of Co-Authors for Thesis by Published Paper

The authors listed below have certified that:

1. they meet the criteria for authorship in that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
2. they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
3. there are no other authors of the publication according to these criteria;
4. potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit, and
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Contributor	Statement of contribution
Michele Janse Van Vuuren	Conceptualised the study, collected data, analysed data and prepared the manuscript for publication.
Esben Strodl	Assisted with study conceptualisation, analysis and interpretation of data, and assisted with preparation of manuscript for publication.
Katherine White	Assisted with study conceptualisation, analysis and interpretation of data, and assisted with preparation of manuscript for publication.
Philip Lockie	Assisted with study conceptualisation, analysis of data, and assisted with preparation of manuscript for publication

Principal Supervisor Confirmation

I have sighted email or other correspondence from all Co-authors confirming their certifying authorship.

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Revisional bariatric surgery, emotional eating, weight maintenance, qualitative study

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What is already known about this subject

- The prevalence of obesity has reached epidemic proportions worldwide
- Bariatric surgery is currently the most viable and cost-effective treatment for obesity and shows sustainability
- Not all patients achieve excess weight loss (EWL)

What this study adds:

- Grounded theory model from patients' perspectives to identify what contributed to not achieving EWL and led to seeking revisional surgery.

4.1 SUMMARY

This qualitative study offers insight into the experiences, expectations, perceptions, and beliefs that may lead to Laparoscopic adjustable gastric band patients' failure to achieve expected weight loss and seek revisional bariatric surgery. The 23 participants from two sites were interviewed and data were analysed using a grounded theory methodology in order to build a causal model. Analysis of participants' reports identified "Unrealistic expectations of the LAGB" as the core category. Additionally, the restriction of the band had a negative impact on participants' social interactions, leading to feelings of deprivation and, thus, to a desire for reward from food choices and consequently an increase of consumption of high calorie dense foods. These foods were chosen because of their specific texture or ability to provide reward. The resulting increase in weight or failure to achieve excess weight loss, led to feelings of shame and loneliness and emotional eating resulting in increased the consumption of rewarding foods. Thus, identifying the strength of an external locus of control and thus, unrealistic expectations of LAGB and emotional eating behaviours are important in those who are present initially for primary bariatric and revisional bariatric surgery, as they may contribute specifically to these patients' weight regain and consequent failure to achieve excess weight loss.

4.2 INTRODUCTION

Bariatric surgery is the most effective and durable intervention for weight loss in obese and morbidly obese patients and its incidence has increased exponentially. Laparoscopic adjustable gastric band (LAGB), a restrictive procedure, has been the most prevalent bariatric procedure in Australia for the last decade (Hii et al., 2012a). Recent studies have indicated that, at 18 to 24 months post LAGB surgery, weight loss stabilises and a significant proportion of patients experience weight regain (Larsen, Geenen, et al., 2004). Other studies report that a growing number of LAGB patients require revisional bariatric surgery for failed excess weight loss (EWL) and unsuitability of the band(Hii et al., 2012a). In addition, the outcome from revisional surgery may be inferior to primary procedures(Iannelli et al., 2009). Successful weight loss after primary LAGB can be defined as more than 50% excess BMI loss or a reduction of BMI to less than 35 $kg/m^{2.}$ (Zundel & Hernandez, 2010). Although inadequate EWL and/or failure to maintain EWL are the most common indicators for revisional bariatric surgery, to date, this surgery provides little guarantee of success.

Physiologically, gut hormones are important regulators of energy expenditure and have been implicated in the mechanisms of weight loss post bariatric surgery as they cause a hunger and satiety effect and have an important role in appetite regulation (Pournaras & le Roux, 2009). However, little is known about these mechanisms of weight loss following LAGB (Tadross & le Roux, 2009a).

The variability in post surgical weight loss outcomes has been attributed to activity levels and failure to change problem eating behaviours, which include binge eating, night eating syndrome, grazing, and "emotional eating". Fischer and colleagues found that emotional eating, (*i.e.,* eating in response to moderate emotional states), is frequently found among patients suffering obesity and that the practice of emotional eating can obstruct weight loss outcomes (Fischer et al., 2007). Research has indicated that there is a high prevalence of binge eating among patients who seek bariatric surgery and that binge eating has been shown to be an indicator of difficulties with post surgical weight loss. Colles, Dixon and O'Brien(Colles et al., 2008b) found that uncontrolled eating and grazing were related to poorer weight loss after gastric banding, yet White, Kalarchian, Masheb, Marcus, and Grilo found

postoperative locus of control (LOC) predicted a poorer weight loss outcome after surgery (White et al., 2010). Other studies have shown that eating behaviours may not improve after bariatric surgery, in that, bariatric patients ate more fatty foods and sweets that participants who had attended a lifestyle intervention program for weight loss(Kruseman et al., 2010). In a study by Kafri, Valfer, Nativ, Shiloni, and Hazzan, revisional bariatric patients had lower levels of healthy food selection, food tolerance, normative eating patterns, and physical activity than primary patients (Kafri, Valfer, Nativ, Shiloni, & Hazzan, 2011).

Thus, studies to date show a number of factors that may contribute to the failure of bariatric surgery patients in achieving post-operative EWL. However, the psychosocial impact of a patient's inability to change their eating behaviours or of developing problematic eating post bariatric surgery and, thus, not achieving EWL is not understood.

It is this lack of clarity regarding explanations for patients' failure to achieve EWL that this qualitative study investigates. The goal of this study is to explore, through an inductive approach, the experiences, expectations, perceptions, and beliefs that lead to patients' failure to achieve expected weight loss and seek revisional bariatric surgery. In this study, these findings are used to build a causal model that may aid clinicians in providing information, making recommendations, and implementing interventions for revisional and bariatric patients to assist in achieving desired weight loss outcomes.

4.3 MATERIALS AND METHODS

4.3.1 Participants

Participants were recruited from two bariatric surgery practices. A total of 23 participants (18 females and 5 males) were included based upon the following criteria: they had previous Laparoscopic adjustable band (LAGB), the average time elapsed since LAGB was 3.72 years (SD= 1.48), failure to achieve excess weight loss outcome (< 50% of EWL), and they had recently undergone revisional bariatric surgery (M= 1.78 months, SD = 0.95). The average weight of the sample at LAGB implantation was 129kg (SD=29.98) and the lowest average weight reached 98.kg (SD=21.88). The average weight loss 30.69kg (SD =20.52) and regain 24.21kg (SD=20.23). The mean weight at date of revisional procedure was 123kg

(SD=31.90). Demographic information are shown in Table 4.1. The quantitative measure Depression Anxiety and Stress Scale (DASS; was included as a descriptive measure only (Lovibond & Lovibond, 1995). The majority of participants achieved scores in the Normal range for Depression, Anxiety, and Stress on the DASS. However, seven participants achieved scores in the Severe range and four in the Extremely severe range for Anxiety. These data are shown in Table 4.2.

Table 4.1: Socio-Demographic characterization of the sample

Characteristic	***n***
Marital Status	
Married	13
Divorced	1
Single	8
Widowed	1
Working Status	
Employed full time	13
Employed Part time	8
Unemployed	1
Retired	1
Level of Education	
High School	13
Post-High School	3
University	7

Note. Demographic information regarding participants' age, gender, cultural background relationship status, level of education, and occupation (if working) was collected.

Table 4.2: Frequency of levels of depression, anxiety and stress in the participants

	Normal	**Mild**	**Moderate**	**Severe**	**Extremely. Severe**
Depression	12	4	5	2	0
Anxiety	12	0	7	0	4
Stress	16	3	3	1	0

Note. The DASS is a set of three self-report scales designed to measure the negative emotional states of depression, anxiety, and stress.

4.3.2 Procedure

Participants were given information flyers by dieticians, nurses, and surgeons at the two bariatric clinics. The participants contacted the researcher who is the primary psychologist at both practices, and the study was explained, and an appointment made. At this appointment, the participants signed consent forms and were informed that the interview would be audiotaped. Each interview lasted between 60 and 90 minutes and included open ended questions. In addition to the semi-structured interviews, the participants completed the DASS to obtain descriptive data. Participants were provided with AUD$50 movie vouchers for participating in the study. Interview questions are shown in Table 4.3.

Table 4.3: Interview Questions

Interview Questions
What led you to be thinking about revisional surgery?
What do you think were the factors that contributed to your first procedure being unsuccessful?
How has the lack of success with the first procedure affected you emotionally?
What is your relationship with food?
What kind of challenges are you facing?

4.3.3 Ethical Considerations

Ethics approval was obtained from the university's Human Research Ethics Committee. Permission to conduct interviews was obtained from both sites where interviews were conducted.

Data analysis

Each interview was audiotaped, transcribed successively, and then coded, by the primary researcher. NVivo 10 was utilised to code the data line-by-line, using open coding according to Grounded Theory method (Corbin & Strauss, 2014). Related codes were then grouped into categories and relationships between these categories were examined utilising axial coding. Data collection and analysis were done simultaneously (*i.e.,* theoretical sampling). Through selective coding, a core category was identified which tied all the concepts together.

Validity and Reliability

Participants were offered a summary of their transcripts to check for accuracy. An inventory of codes with their descriptions was kept in a codebook and NVivo software 10 was utilised to store the memos on the process of coding and the memos on the theoretical codes. Further, field notes, which contained observations made by the researcher during interviews, were kept in NVivo memos. Further memos were kept discussing the process of coding (code notes), and memos on theoretical codes were also kept. Data collection continued until no new themes emerged (*i.e.,* saturation). Emerging codes were presented to participants in the later stages of the study to extend upon and redefine the theory. The theory was further refined and tested by utilising disconfirming evidence and negative case analysis. Through theoretical sampling, the researcher modified the questions and the sample population being interviewed, in order to confirm or disconfirm emerging hypotheses and to improve understanding of the limits of the emerging theory.

A supervisory team assisted throughout the data analysis phase to ensure the validity of the data, by challenging ideas and discussing interpretation of codes, categories and the building of the theory. Further, through constant reflexivity during data analysis, the researcher sought to minimize the impact of subjectivity. These process contributed to the inductive and deductive processes that are critical to

building a theoretical model that is grounded in the data from the patients' perspectives.

4.4 RESULTS

4.4.1 Developing the model

Participants reported six key factors that contributed to them not achieving their EWL post-LAGB and which led to them seeking revisional bariatric surgery. Following the grounded theory analysis of the 23 interviews, a model emerged with core category of Unrealistic expectations of LAGB and five conceptual categories: Restriction of band, Impacts on social interactions, Desire for food choices that give reward, Increase in consumption of high calorie dense food choices because of texture and reward and Shame, loneliness and loss. These categories and a detailed description of the proposed model that identifies emergent processes and their interrelations are presented in the next sections, together with quotes that capture participants' experiences.

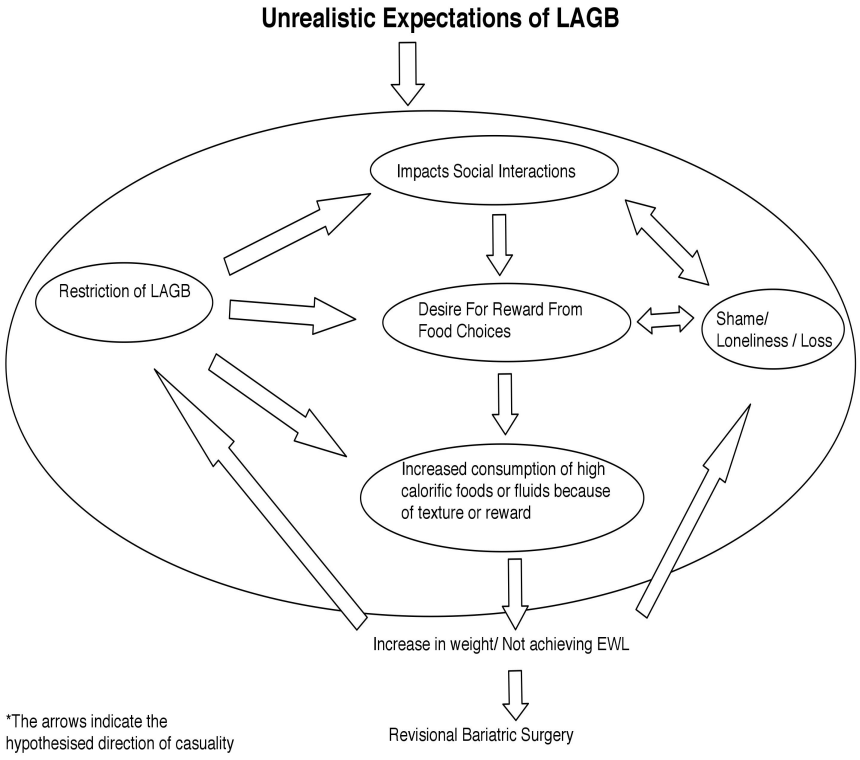

Figure 4.1. Grounded Theory Model for Revisional LAGB participants

Unrealistic expectations of LAGB

When recounting their initial decision participants placed significant expectations on the LAGB surgery itself, to address their long-term difficulties in both social and health domains and limit the desire for high calorie dense foods. This belief in surgery as the only satisfactory solution to these difficulties and their diminished responsibility suggests an external locus of control. Unrealistic expectations through the process of selective coding was identified as the core category. This core category is the concept that appeared most frequently in patients' interviews and that all other categories were related to.

' I entered into it thinking it was going to be a quick fix. I wasn't prepared to do the hard yards to make it work. So then I just didn't put any effort into it. I thought the band would, just solve everything.' (Participant 2 reported everything to be: Health problems, weight, social and relationship difficulties and desire for high calorie dense foods).

Restriction of band

The restriction of the band had significant psychosocial consequences in that it limited and impacted upon social interactions. Participants' responses reflected that the restriction of the LAGB was a significant factor in that it not only inhibited their ability to socialise but limited and dictated food choices and thus facilitated the development of maladaptive eating patterns.

'I felt very restricted on what I could eat – there were so many things you couldn't eat that it was easier just to eat things that I knew would work for me.' (Participant 23)

Desire for reward from food choices

It was apparent from the participants' descriptions that the restriction, which is the function of the band, led to participants feeling deprived of the ability to eat certain foods and that in response to that deprivation, there was an increased desire for reward foods, such as ice cream and chocolate (both high in calories), which were described as comfort foods.

'Ice cream was a big one. I drank a lot of chocolate milk; just things that would go down easily and I knew they'd stay down. I just wanted comfort foods too. Something that would make me feels good temporarily.' (Participant 7)

Participants described how the functionality of the band led to an increased consumption of calorific foods and drinks.

'I think it (restriction) had a lot to do with what I was putting in my mouth and how often I was and then when it was tight, I just ate more crap foods like ice cream and chocolate milk.' (Participant 16)

Increase in consumption of high calorific foods or fluids because of texture or reward

Participants reported how the restrictive nature of the band led to the consumption of calorific foods (because of the texture) and the desire for reward.

'I got to the stage where nothing would go down, I could just eat ice cream and everything else naughty as in chocolate because it would go through and it never got stuck. The minute you'd sit down to eating a meal of meat and vegetables, you would feel the restriction. Then I would just turn to the good old ice cream [comfort food] because I couldn't eat a normal meal.' (Participant 19)

Thus, the restrictive nature of the band facilitated the development of maladaptive eating and drinking patterns. An increase in weight after a period of time or not achieving EWL was clearly attributed, by participants, to the inability to eat certain foods as a result of the restrictive nature of the LAGB. This was compounded by a desire for comfort or reward from food resulting in an increased consumption of calorific foods because of their texture. Participants indicated this perpetuating cycle of consumption of high calorie dense foods led to not achieving EWL and elicited a feeling of failure.

'The easiest foods to eat were the ones that weren't good for me like chips, chocolate, ice cream. I probably lost maybe four or five kilos in my first week on liquids. That's where I lost the majority of my weight, I was just not really eating the right stuff afterwards, because I couldn't eat proper food I ate the foods that could go through easily. I felt like I failed from the start.' (Participant16)

Impacts on Social Interactions

Participants' responses reflected that the restriction of the LAGB was a significant factor in inhibiting their ability to socialise. Participants reported they

engaged less socially, felt excluded and that the quality of their relationships diminished.

> *'I would say, when we'd be invited somewhere, 'Why would we go to that?' [can't eat]. So then we ended up not having much social life, we didn't spend as much time with friends. When you continue to say no, they end up stop asking.' (Participant 12)*

The consequences of not being able to not able to eat out socially and feelings of loneliness, led to feelings of social deprivation and exclusion and thus, consuming foods that could be consumed because of their texture and that gave an experience of reward.

> *'I found the only way around going out with friends was to sit at the table and not eat. That's very hard. And then when I'd go home, I'd end up having chocolate or something like that, because I couldn't eat but I'd feel like I was missing out, it was horrible, so why bother going? I turned to a chocolate [comfort food] and things like that, because I couldn't eat what they were having, so I would eat what I could eat.' (Participant 14)*

Shame and Loneliness

In sharp contrast to the initial hopes and expectations of the LAGB being a miracle cure, participants reported a feeling of shame with regards to not achieving EWL and then having a revisional procedure. The quote below illustrates the far-reaching impact of a failed bariatric procedure.

> *'Yeah, over years of trying [to lose weight]. You've gone through all that pain and all that effort, you're actually worse off than where you started. It was all kinds of difficult. In such a dark place, so you don't want to go out [with friends]. And you just spent twenty thousand dollars. You spent a year in pain and everyone's watching you, as the weight goes down and everyone's watching it get back up. You're always unhappy and down. You just want to be invisible.' (Participant 1)*

Participants reported that they felt shame given they had failed to achieve EWL and that led to an increased desire for foods that give reward.

> *'I hated myself so much, I was so ashamed and I just thought, I can't do it on my own, obviously, I've tried and tried, and this [LAGB] has got to work for*

me or you're going to be unhappy for the rest of your life. The more weight I put back on the more I hated myself. I just couldn't stop snacking and drinking the chocolate milk.' (Participant 7: Chocolate milk identified as a food that gave reward)

Participants identified that food relieved their emotional pain continued to assist in coping with negative affect.

'I think because food was a crutch, that I think it will always remain that for me. I think it's my coping mechanism. Some people, I guess, have alcohol, and some people have drugs, I guess for me, food was my comfort, to help me through many difficulties. Yes, I think that hasn't changed, sadly.' (Participant 17

The following excerpt illustrates that the increase in weight and inability to sustain the weight loss precipitated feelings of shame.

'I did think it was going to be the answer to my problems. I never thought I would be here again. [Regained all weight lost with LAGB.] So that's what makes me feel like I'm a failure.' (Participant 12)

The conceptual category, Shame/loneliness/loss has a bidirectional relationship with categories; Desire for reward from food choices and Impacts on Social Interactions. Participants reported that increased negative affect, including grief, loss, shame and loneliness, precipitated emotional eating and described eating specific textured calorific foods as a coping strategy to deal with negative affect.

'And I just wanted comfort foods. Something that would make me feel good temporarily. I wasn't in a good place mentally. Things that had good texture I guess, like ice-cream and milk and sweet things was more what I was craving – that sort of thing, just sweets, something to give me an instant feeling of happiness in my mouth, I guess.' (Participant 5)

Participants reported the experience of failure with LAGB negatively impacted social interactions.

'I felt like a failure with the lap band and I just felt that it wasn't anyone else's business. I didn't want to have to explain myself'. (Participant 14)

Increase in weight /Not achieving expected weight loss outcome

The increased restriction of the LAGB through adjustments because of the inadequate weight loss or regain precipitated the increased desire for reward /soothing from food and sabotaging behaviour.

'The weight came back and I just found that it wouldn't matter how much the doctor tightened it up, I can always find ways around to satisfying my hunger. I would still continue to eat and eat, stuff I could get down I think it was a comfort, a compensation, or something, I just felt… I don't know whether it was guilt, I just wanted to eat sweet stuff.' (Participant 4)

In addition, it is apparent from the quote below that increased negative affect, precipitated the desire for reward from high caloric food choices and resulted in weight regain.

'About two years ago I started having troubles with putting the weight back on, overeating and I'd been upset over my daughter (grief and loss), and eating all the wrong foods. I was miserable as I put all of that weight (50kg) that I had lost with the band, back on. When I fell in a heap, I turned straight to the bad. Sweets, chocolates and potato chips - the bad things that I have always had in my life for comfort.' (Participant 12)

Increase in weight/not achieving EWL results in revisional bariatric surgery.

Participants described that the inability to lose the weight or the experience of weight regain created an unpleasant emotional state and they thus sought additional bariatric surgery.

'I quite desperate too, that I wasn't able to get the weight off and keep it off, and that I had to do something more permanent. I got down to about 71 kg but then I just put it all back on.' (Participant 7)

4.5 DISCUSSION

Currently, little is known about the causes of failure to reach EWL for patients whose LAGB procedure is unsuccessful. Previously, some of the reasons identified for failure to achieve EWL include the inability of bariatric surgery patients to make and sustain lifestyle and behavioural changes. Similarly factors that hinder weight management attempts in the non-bariatric population are emotional or habitual eating

or reverting back to old dietary habits (Burke, Wang, & Sevick, 2011). This grounded theory study developed a causal model by examining the patients' perceptions of reasons for inadequate weight loss. The interpretation of the data suggests that the emerging model's core category is an "Unrealistic expectations of LAGB". Patients reported that they placed high expectations on the LAGB to change their high calorie dense food choices, long-term weight, relationship and social difficulties and perceived the LAGB surgery itself as the last resort to lose weight, as they had attempted and failed at many diets in the past. This externalised thinking pattern indicates limited ownership in making lifestyle and behavioural changes post LAGB. This interpretation aligns with Rotter's (Rotter, 1966) Social Learning Theory notion, of internal and external locus of control. Locus of control is described on a continuum and refers to the beliefs individuals have in the amount of control over their lives. In support of these interpretations, other studies have found that participants with an internal locus of control were more successful in achieving their initial weight loss goals than program completers with similar values who had an external locus of control (Lefcourt, 2014). A prior qualitative study also showed that patients conceptualized bariatric surgery as a miracle where the health professional is given a central role (da Silva & da Costa Maia, 2012a).

In addition to the perception, in this study, that the LAGB was the solution (and possibly as a consequence of this perception), the ongoing desire for high calorie foods was not changed by the LAGB. Participants referred to as certain foods as "an addiction" and "that your body has to have it". In recent literature, an addiction model of obesity has been proposed. Addiction is seen as prevalent in a percentage of people suffering from obesity, as it resembles drug addiction. For example, responses to certain foods (those high in fat, salt and sugar) are similar to responses to addictive substances insofar as they engage brain systems and that they result in behavioural adaptations comparable to those engaged in drug use (Ziauddeen, Farooqi, & Fletcher, 2012).

Although, LAGB imposes restrictions on the type and volumes of food consumed in a period of time, requiring patients to eat small meals at regular intervals, LAGB does not dictate the choice of all foods. In fact, the actual functionality of the band had a number of negative impacts on the participants in the study. They reported feelings of social deprivation as they felt excluded, which led to a desire for food

choices that give reward to deal with this perceived negative affect. This rebound eating can be understood as consistent with restraint theory (Ogden et al., 2005). The Restraint Theory was developed to evaluate both causes and consequences of the attempts to restrict food intake with the intent of losing or maintaining weight. The Restraint Theory postulates that eating patterns are influenced by the biological need for food on the one hand, and the cognitive efforts (restraint) to resist that desire on the other. Restraint can be both qualitative (type of food) and quantitative (amount of food). Thus, a perpetuating cycle of behaviour of rebound eating in response to the restriction of foods both in quality and quantity leads to increased consumption of specific high calorie dense foods because of the reward or the ability to consume them.

In addition, the LAGB affected participants in this study in the social domain: for example, they were not able to socialize by going out to dinner and, thus, the LAGB had a negative impact on their relationships with family and friends. In response to this social deprivation, participants regulated their negative emotional states by eating calorific food that is associated with comfort to cope with feelings of exclusion and the resulting loneliness. Thus, socio-cultural factors obstructed their weight loss. Other studies have reported that family were identified as invaluable sources of support. Further, shame and loneliness were seen as contributing factors to the negative eating cycle and had a bidirectional relationship with desire for reward from food choices. The experience of failure with the LAGB and requiring revisional surgery increased emotional distress and, thus, emotional eating, or emotionally triggered eating(Canetti, Berry, & Elizur, 2009), which has been defined as a tendency to eat in response to negative emotions and as a method of coping with emotional distress. The increased distress of failure to achieve the expected weight loss outcome further perpetuates the maladaptive eating cycle.

According to Fairburn, binge eating develops as a consequence of excessive restriction either of calories or types of foods (Fairburn, Cooper, & Shafran, 2003). The increase in restriction of the LAGB due to inadequate weight loss or weight regain reduces the volume of foods and types of foods maintaining the maladaptive eating cycle. As a consequence of the increased feelings of deprivation, there is an increased need for soothing from high calorific foods that can be ingested. Thus, the eating of high calorific foods is a method of coping with the negative affect and

deprivation by providing comfort. As in other studies, participants reported emotional eating, or eating in response to emotional distress, as a historical coping strategy that was still prevalent post surgery. Further, consistent with other studies, emotional eating in this study was indicated as a risk factor for not achieving EWL post-bariatric surgery.

The emerging model study suggests three important psychosocial vulnerabilities that may be present in patients who have failed to achieve EWL and have had revisional bariatric surgery: Unrealistic expectations of LAGB, ongoing and increased consumption of high calorie dense food as a primary coping strategy to cope with negative affect, and feelings of deprivation. The restrictive nature of the band may, in fact, facilitate maladaptive eating patterns in this subgroup of patients who have failed to achieve EWL and, thus, have revisional bariatric surgery. The findings of this causal model is illustrated using patients' perspectives and offers important insights as to what individuals perceive as the factors that have contributed to their failure with the LAGB and decision to have revisional surgeries.

4.5.1 Study Limitations

The participants are from the same ethnic background. Additional research is required on the experiences of weight regain in other ethic populations' post-bariatric surgery. Further qualitative research would be useful to confirm the model and, in particular, explore the experiences of those participants not achieving success post - revisional bariatric surgery.

4.5.2 Conclusions and recommendations for practice

Bariatric patients need to be informed on the importance of behavioural changes regarding high caloric foods and developing adaptive coping strategies to assist with emotional eating in order to achieve success and maintain weight in the long-term. No patient identified lack of physical activity or ongoing clinic contact as factors that may have contributed to not achieving EWL or weight regain. Given these factors identified role in weight maintenance in the literature, longer-term follow up and education is paramount. Consequently, the surgery should be promoted as a collaborative approach between patient, surgeon, and health care providers and the patient's role in making lifestyle and behavioural changes that incorporate physical activity highlighted. In addition, this study suggests the

importance of the screening of potential bariatric patients, in particular those presenting for revisional surgery, both before and periodically after surgery which may help to identify those with an external locus of control, taste for high calorific foods, and tendency for emotional eating in order to assist them to develop effective coping strategies to deal with the social and emotional and challenges that they may experience post-bariatric and revisional surgery.

4.5.3 Conflict of interest statement

No conflict of interest has been declared.

4.5.4 Acknowledgements

Most of the participants were not the primary patients of doctors at either site but were referred to these clinics for revisional surgery.

4.5.5 Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

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Chapter 5: Study 2

The purpose of this manuscript in the thesis was to ascertain the psychosocial factors that patients themselves identified from their own individual perspectives had contributed to them not achieving the expected weight loss outcome following a primary LAGB and led them to thus seeking a multiple revisional bariatric surgeries to achieve a satisfactory weight loss outcome. Participants were recruited from two bariatric surgery practices. A majority of the sample had three revisions (n = 11) with the remaining participants having four to six procedures. Revisional procedures included: LAGB repositioning, gastric sleeve plication, sleeve gastrectomy, roux-en -Y gastric bypass (RYGBP), banded gastric bypass and RYGBP with fixed ring, revision of gastric pouch and loop distal bypass.

Participants were asked about the outcome of the revisional surgeries and the factors and challenges that that had influenced and precipitated this outcome. Participants were asked questions to explore their eating behaviours and activity levels. The interview data were then analysed using grounded theory methodology. All the participants in this study were female. However, this not an unexpected cohort in terms of gender and age, as more females have bariatric surgery, and post -menopausal women with a longer dieting history are less likely to achieve EWL.

The participants in this study were a unique cohort of patients as although there has been an increase in revisional bariatric surgery for failed LAGB, revisional surgery is an expensive undertaking and comes with an increased risk of complications and a higher risk of morbidity and mortality and thus majority of patients who do not achieve EWL do not go on to have revisional bariatric procedures. Thus, this is an important study as it has provided a unique causal model grounded in the data and the findings of this qualitative study may guide clinicians in the identifying and supporting of at-risk revisional bariatric surgery patients,

As with Study 1 participants reported that they found the experience of telling their weight loss journey story cathartic and valuable. However, in contrast to Study 1 participants in this study reported a greater sense of disillusionment in bariatric surgery and in their own ability to address their long standing weight difficulties and participants reported a profound feeling of failure.

This manuscript has been published online ahead of print in the *Journal of Health Psychology.* It is published by the major scholarly publishing house of Sage Publishing and in 2014 had an Impact Factor of 1.748 and an impact ranking of 56/119 in Psychology, Clinical Source: 2014 Journal Citation Reports ® (Thomson Reuters, 2015)

Publication title: Psychosocial presentation of female bariatric surgery patients after multiple revisional surgeries: A qualitative study

Authors: Michele Janse Van Vuuren, Esben Strodl, Katherine White, and Philip Lockie

Publication date:

Statement of Contribution of Co-Authors for Thesis by Published Paper

The authors listed below have certified that:

1. they meet the criteria for authorship in that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
2. they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
3. there are no other authors of the publication according to these criteria;
4. potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit, and
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Contributor	Statement of contribution
Michele Janse Van Vuuren	Conceptualised the study, collected data, analysed and interpreted data and prepared the manuscript for publication.
Esben Strodl	Assisted with study conceptualisation, analysis and interpretation of data, and assisted with preparation of manuscript for publication.
Katherine White	Assisted with study conceptualisation, analysis and interpretation of data, and assisted with preparation of manuscript for publication.
Philip Lockie	Assisted with study conceptualisation, analysis of data, and assisted with preparation of manuscript for publication

Principal Supervisor Confirmation

I have sighted email or other correspondence from all Co-authors confirming their certifying authorship.

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Date: 05 /07/2016

Journal of Health Psychology

Article Type: Original Article

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5.1 ABSTRACT

Abstract

Bariatric surgery is currently the most viable and cost-effective treatment for obesity. This study aimed to understand, from a female patient's perspective, what contributed to not achieving or maintaining excess weight loss from a primary Laparoscopic adjustable band (LAGB) surgery, leading to subsequent multiple revisional bariatric surgeries. The purposive sample of participants *(N* = 17 females) were over 18 years had a primary failed LAGB and had more than three revisional procedures. Participants were individually interviewed and data were analysed from a grounded theory methodology to build a causal model with the core category of unrealistic expectations of bariatric surgery and other important conceptual categories.

Keywords: Revisional bariatric surgery, grounded theory, qualitative, obesity

5.2 INTRODUCTION

Bariatric surgery is currently the most effective and durable intervention for weight loss in patients suffering with obesity and morbid obesity and its incidence has increased exponentially worldwide (O'Brien, MacDonald, Anderson, Brennan, & Brown, 2013a). Laparoscopic adjustable gastric band (LAGB) has been the most commonly performed bariatric procedure in Australia for the last decade (Hii et al., 2012a). However, not all patients achieve excess weight loss (EWL) and some experience weight regain, increasing the demand for revisional surgeries (Shimizu et al., 2013).

In Australia, as well as worldwide the reported LAGB surgical revision rate varies greatly between 10% to 30 % (Bardsley & Hopkins, 2010; Lanthaler et al., 2010; Lewin, Campbell, Sanghvi, Skinner, & Hopkins, 2015; O'Brien et al., 2013a; Stroh, Hohmann, Schramm, Meyer, & Manger, 2011; Vijgen et al., 2012). The type of revisional procedure varies depending on the primary procedure and revisional surgery is significantly more challenging than the initial procedure (Hii et al., 2012a). Inadequate weight loss, as per the Reinhold criteria, is described as achieving less than 50% excess weight loss (EWL) (Reinhold, 1982) and the meta analysis by Buchwald et al. (2004) reported a range of between 40 to 60% EWL following LAGB. However, obesity is a chronic disease and an estimated 10 – 30% of patients experience some degree of weight recidivism post-operatively, regardless of the type of bariatric procedure, starting as early as 18 months and as far out as 20 years (Daigle et al., 2014; Magro et al., 2008; Sjöström et al., 2012).

Inadequate weight loss, weight recidivism, band related difficulties, surgical complications or loss of quality of life are the indications for revisional bariatric surgery (Lim et al., 2009). Poor diet quality with excess calories, insufficient physical activity and lack of nutritional counselling are associated with weight regain in this population (Freire, Borges, Alvarez-Leite, & Correia, 2012). Maladaptive eating behaviours post-surgery such as a loss of control eating (Marino et al., 2012), emotional eating (Bocchieri, Meana, & Fisher, 2002b), grazing (Colles, Dixon, & O'Brien, 2008a) and sweet eating (Burgmer et al., 2005b) have been associated with poor weight outcome prompting some patients to seek revisional surgery to remediate (Shimizu et al., 2013). Rutledge et al. (2012) reported a linear relationship between psychiatric disorders and weight regain in the first two years post-

bariatric surgery and patients diagnosed with more than two psychiatric disorders were more likely to stop losing weight or experience weight regain when compared to patients without psychiatric disorders. Thus, mental health difficulties and maladaptive eating patterns may be associated with a poor weight loss trajectory post-bariatric surgery.

Physiologically, gut hormones are important regulators of energy expenditure and have been implicated in the mechanisms of weight loss post-bariatric surgery, as they cause a hunger and satiety effect and have an important role in appetite regulation (Pournaras & le Roux, 2009). Little is known about these mechanisms of weight loss following LAGB (Tadross & le Roux, 2009b). However, there is strong evidence that the Roux-en-Y gastric bypass (RYGB) procedure impacts this weight regulatory system on multiple levels and resets the patients preoperative weight set point (Bueter et al., 2009). Rates of short term weight loss post-revisional surgery, in some studies have been comparable with the weight loss following primary surgery (Victorzon et al., 2010). The impact of the weight regulatory system on the weight loss and regain trajectory for patients undergoing revisional and multiple revisional bariatric surgeries is unknown. Thus, physiological adaptations may contribute to the challenge of achieving or maintaining weight loss post-revisional and multiple revisional bariatric surgeries.

Bariatric surgery patients view the surgery as the final, drastic measure to lose weight and gain control over eating behaviours and hope that the weight loss will positively affect their lives (Kaly et al., 2008; Ogden et al., 2005). Therefore, because of the degree of investment in this decision, for these patients, the outcome of surgery is likely to have significant effects not only upon weight loss but upon the patients' psychosocial wellbeing (Kubik, Gill, Laffin, & Karmali, 2013). Women struggling with obesity are more likely to undergo bariatric surgery (Grilo, Reas, et al., 2005) and , as evidenced above, 10% - 30% of patients do not achieve EWL or experience weight loss followed by weight regain (Daigle et al., 2014; Magro et al., 2008; Sjöström et al., 2012). Revisional bariatric surgery comprises 5% - 15% of the total cases of bariatric surgery (Behrns et al., 1993; Radtka et al., 2010; Shimizu et al., 2013; Spyropoulos et al., 2010). Patients presenting for revisional and multiple revisional bariatric surgeries are an understudied population and, although there are some suggested psychosocial and physiological reasons for failure to achieve EWL following LAGB , no studies to our knowledge have examined any unique causes of multiple revisional bariatric surgery patients experiencing an unsatisfactory psychosocial outcome (Janse Van Vuuren et al., 2015). Identifying these factors may be helpful for both prevention

and intervention and improve long-term outcomes. This qualitative study explores from an inductive approach what individuals perceive as the factors that have contributed to them not achieving a satisfactory outcome and thus requiring multiple revisional surgeries.

5.3 METHODS

5.3.1 Participants

A total of 17 female participants from two bariatric practices were included based upon the following criteria: Primary LAGB failure to achieve or maintain EWL (< 50 % of EWL), and multiple revisional bariatric surgeries. The % EWL was defined as the operative weight at the revisional procedure minus the follow-up weight, divided by the excess weight, multiplied by 100. The indication for the primary revisional surgery in the patients was insufficient weight loss and or weight recidivism. Their measured mean weight at the time of LAGB implantation was 121kg (*SD* = 28.65), mean BMI of 42.8kg/m^2 (*SD* = 7.69). The lowest average weight reached with LAGB was 91kg (*SD* = 15.31), mean BMI of 36.7kg/m^2. The average weight loss with LAGB was 30kg and the mean regain prior to primary revisional surgery was 20kg. The mean highest weight post-LAGB was 111kg (*SD* = 28.05), BMI of 39.8kg/m^2. The participants were aged 43 to 70 years (*M* = 52 years, *SD* = 8.35). The average time elapsed since LAGB was 5 years (*SD* = 2.90). A majority of participants had three revisions (*n* = 11) with the remaining participants having four to six procedures. Revisional procedures are shown in Table 5.1

Table 5.1: Sequence of revisions performed

Revision surgery	No. of revisions
1. Band reposition (x2), RYGB	3
2. Band reposition (x2), RYGB	3
3. Band reposition (x2), RYGB	3
4. Band reposition, RYGB, fixed band	3
5. Band reposition, RYGB, fixed band	3
6. Band reposition, RYGB, revision of RYGB	3
7. RYGB, revision of gastric pouch, loop distal bypass	3
8. Band reposition, RYGB, revision of RYGB	3
9. Band reposition, RYGB, band on RYGB	3
10. Band removal, SG, RYGB	3
11. Band reposition, band removal, LSG	3
12. Band removal, LSG plication, revision gastric sleeve plication, RYGB	4
13. Band removal, LAGB, RYGB, band on RYGB	4
14. Band reposition, RYGB, revision of RYGB, revision bypass gastric loop,	4
15. Band reposition, band removal, LSG plication, RYGB	4
16. Band removal, BPD, LSG plication, gastric resection SG, resectional RYGB, band on RYGB	6
17. Band reposition, band removal, LSGP, revision of plication, RYGB, revision of gastric bypass pouch	6

LAGB (Laparoscopic gastric band), RYGB (Rouen Y gastric bypass), LSG (Laparoscopic Sleeve Gastrectomy), BPD (Biliopancreatic diversion with duodenal switch). Sequence of revision presented according to procedure.

5.3.2 Procedure / Data collection

Dieticians, nurses and surgeons at the two bariatric clinics gave study flyers to participants who met the inclusion criteria. The participants contacted the researcher, who is the primary psychologist at both practices, and the study was explained, and an appointment made. At this appointment, the participants signed consent forms and were informed that the interview would be audiotaped. The interviews conducted at the bariatric clinics lasted between 60 and 90 minutes and included the open-ended questions designed by the researchers: '*What has been the outcome of the revisional surgery for you?'; 'What are the factors that have influenced this outcome?'; 'What kind of challenges are you facing?'*. The following sub questions were asked to prompt the participant to expand on their initial response, '*How has the surgery affected your eating?'; 'What about your self esteem'; 'Tell*

me about your social life and relationships?'; 'What are your activity levels?'. In accordance with Grounded Theory methodology the study involved a systematic process of gathering, analysing and conceptualising the qualitative data with the primary aim of developing a coherent theory through inductive examination of the data (Charmaz, 2006). In addition to the semi-structured interviews, the participants completed the Depression Anxiety and Stress Scale to help describe the sample. The DASS is a set of three self-report scales designed to measure the negative emotional states of depression, anxiety, and stress. According to DASS Measure responses, the majority of participants had elevated levels of Depression and Anxiety and Stress, with six participants reporting severe levels of Anxiety. Participants' bariatric history were obtained from the participants or medical records. Participants were provided with AUD $50.00 movie vouchers as thank you gifts for participating in semi-structured interviews and completing questionnaires. Ethics approval was obtained from the university's Human Research Ethics Committee.

5.3.3 Data analysis

Each interview was audiotaped, transcribed, and coded by the primary researcher. NVivo 10 was utilised to code the data line-by-line, using open coding according to Grounded Theory methodology (Corbin & Strauss, 2014). In analysing these data, the researcher sought to identify parallels, patterns, themes, and commonalities. This was achieved by extracting those phenomena or experiences significant to the participant by assigning each a conceptual label, known as a code. Related codes were grouped into categories and relationships between these categories were examined utilising axial coding. The concepts, categories and sub categories were continually subjected to questions and comparisons, with the aim of identifying the core categories and their links with other categories. Through repeated review and comparison of the interview transcripts and field notes, working with the data guided the researcher toward developing an understanding of the phenomena. Data collection and analysis were done simultaneously. Through selective coding, the final phase of coding, the core category, "Unrealistic expectations of weight loss surgery" was identified which other sub-categories and categories were related to and which tied all the concepts together.

5.3.4 Validity and Reliability

An inventory of codes with their descriptions was kept in a codebook and NVivo 10 was utilised to store the memos on the (1) process of coding and (2) theoretical codes. Field

notes, containing observations made by the researcher during interviews, were kept in NVivo memos. Data collection continued until all categories were accounted for and the variability between the categories explained and the relationships were tested and validated and the theory emerged was grounded in the data. Emerging codes were presented to participants in the study's later stages to extend upon and redefine the theory. The theory was further refined and tested by utilising disconfirming evidence and negative case analysis. Through theoretical sampling, the researcher modified the questions and the sample population being interviewed to confirm or disconfirm emerging hypotheses and to improve understanding of the limits of the emerging theory.

A supervisory team assisted throughout the data analysis phase to ensure the validity of the data by challenging ideas and discussing interpretation of codes, categories and theory building. Through constant reflexivity during data analysis, the researcher sought to minimize the impact of subjectivity. These strategies contributed to the inductive and deductive processes critical to building a theoretical model grounded in the data from the participants' perspectives (Corbin & Strauss, 2014)

5.4 RESULTS

Developing the Grounded theory model

Participants reported 12 key factors that represented their experiences of revisional bariatric surgery. A model emerged grounded in the data, with the core category of unrealistic expectations of weight loss surgery and 11 conceptual categories: interpersonal trauma; unattractive body image as a protection against further emotional and sexual abuse; mental health difficulties; negative affect (shame and loneliness); failure of past surgeries; lack of social support; desire for reward from food; revisional weight loss surgery; change in taste; gap between anticipated and actual experience of reward from food; over eating/uncontrolled eating and perceived unsatisfactory outcome.

The majority of participants reported that they had experienced historical interpersonal trauma which resulted in the development of a negative body image. For some participants the maintenance of weight was perceived as a protection or shield for unwanted physical and/or sexual advances because of prior trauma abuse. Participants reported long-term psychological consequences as a result of the historical trauma/experiences, which brought about negative affect (depression, anxiety or anger). This negative emotional state was compounded by the failure of the past surgeries and a perceived lack of social support.

Subsequent bariatric surgeries brought about changes in taste and satisfaction from eating. Thus, eating was no longer perceived as an effective coping strategy and the efficacy of the emotional eating to deal with and regulate negative emotional states was diminished. In addition, participants reported that the surgeries did not inhibit their actual eating behaviours. As such, unrealistic expectations of bariatric surgery and emotional eating as a consequence of increased negative affect and historical interpersonal trauma led to participants not achieving a satisfactory outcome. The proposed model that identifies emergent processes and their interrelations is presented in Figure 5.1

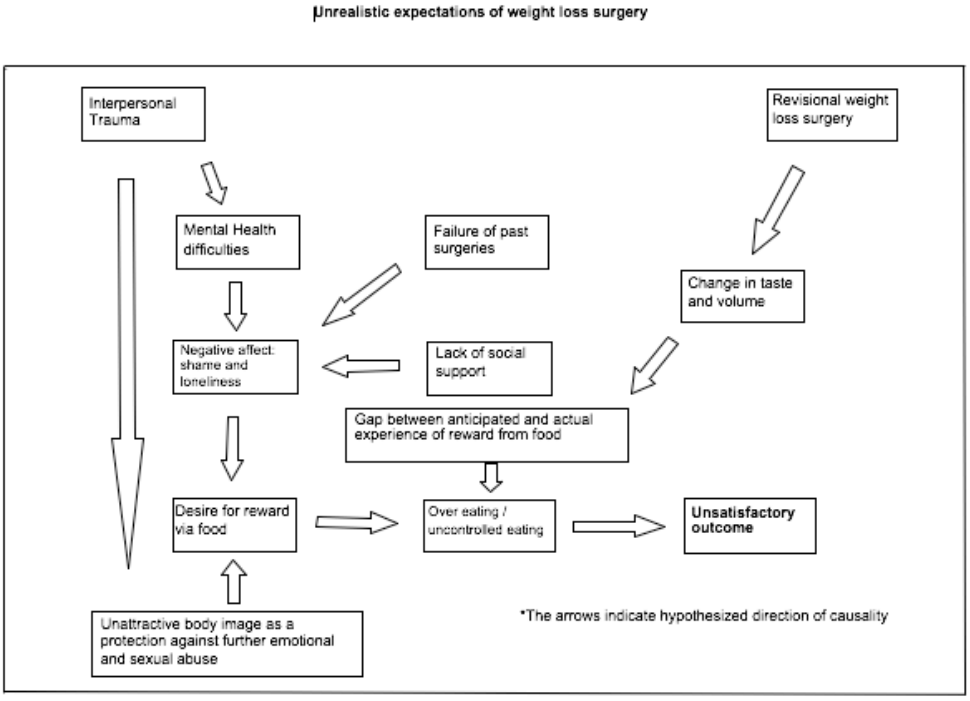

Figure 5.1. Grounded Theory Model for Multiple Revisional LAGB participants

Core category

Unrealistic expectations of weight loss surgery. When considering their initial decision participants placed significant expectations on bariatric surgery to address their long-term difficulties particularly, their eating behaviours and their perceived lack of willpower. This belief in surgery as the only satisfactory solution to these difficulties and their diminished responsibility suggests an external locus of control. Unrealistic expectations of weight loss surgery through the process of selective coding was identified as the core category. This core

category is the concept that appeared most frequently in patients' interviews and that all other categories were related to.

'I was of the opinion, that the surgeries would solve my problems. This is what was going to stop my eating. I guess I wanted the control to be taken away from me because I had done such a lousy job of it by myself, so I was depending on the weight loss surgery to solve my weak will'. (Participant 6)

Conceptual Categories

Interpersonal Trauma. Majority of the participants reported that they had experienced an interpersonal trauma as a child or as an adult.

'He had a .22 rifle he used to take to bed and he say, 'If you cry, you get a bullet'. It was a regular habit then. I was peed on by him, he'd knock me unconscious and then he would pee on me to wake me up. I fell pregnant with my first child and she looked just like him and he said. 'I am going to abuse her when she gets older'. He told me what he was going to do. That's what I lived with for ten years.' (Participant 3)

Participants reported that the experience of the interpersonal trauma led to the maintaining of an unattractive body image.

'How do I put it? A lot of things in my life, especially when I was growing up, I couldn't control, whereas food I could control. It was also a way of getting back, especially as I knew my father hated it when I gained weight. It was a way of getting back, because he was a control freak and it was the one thing I could control. I found food was a good way of distancing myself. I didn't trust people. I trusted nobody, and I mean nobody. Food was a very good way of putting people at a distance, because people don't like fat people.' (Participant 2)

Participants' responses reflected that eating was utilised to increase their body weight and thus, the maintenance of an unattractive body image was perceived by some participants as a protective mechanism against unwanted sexual interaction.

'I just kept eating and eating and eating. I thought well, if I got fat, it would work. I'd thought he'd leave me alone. Then he bashed me because I was fat. Well, I thought if I was fat and ugly, he wouldn't want sex.' (Participant 3)

Participants' reported that the increase in body weight was perceived as a protective measure against further sexual abuse, in that they were subjected to abuse at a certain weight

and thus losing weight resulted in feelings of being vulnerable and exposed. Consequently, being a heavier weight was perceived as a shield or protective measure.

'I know as I lose weight, I know what I look like, and I know as I get smaller, I know what I used to look like and I used to feel threatened by that.' (Participant 9)

Participants' responses reflected that the experience of interpersonal trauma as a child or adult resulted in the experience of mental health difficulties.

'I'm having flashbacks, not to the beatings but to the good times before the beatings. I don't know why I am having these flashbacks. (Participant 3)

Mental Health Difficulties. Participants' responses reflected that they had a history of mental health difficulties.

'I see a psychiatrist. I've had a lot of issues with my younger son, and with myself. Depression and I've been suicidal, but more so depression and trying to get on top of stuff in my life. (Participant 7)

Participants' responses reflected that their prior mental health difficulties were exacerbated by the experience of failure of not achieving a satisfactory weight loss outcome, and this led to them experiencing increased negative affect.

'I was very upset about it. I have a problem with depression, and it just made me even more depressed. It made me feel like a failure again and I'd had lots and lots of that with weight problems during my lifetime. So, it didn't make me feel very good at all.' (Participant 12)

Subsequently the experience of failure of not achieving a satisfactory weight loss outcome contributed to feelings of shame and the experience of loneliness.

'I was so ashamed that the weight was not coming off. My son kept asking me about my weight loss, then he stopped after a while and the same for the people at work. I had told everybody that I was having the previous surgery. I won't do that again. Nobody knows that I have having this surgery. I have not told anybody. I don't want that scrutiny again.' (Participant 5)

Lack of social Support. Participants' responses reflected their experience of lack of perceived social support, as they reported that they felt isolated in their experience of having multiple revisional surgeries.

'I just found that I had no support, no one to talk to, who would understand what I had been through with all these surgeries.' (Participant 6).

The experience of perceived lack of social support resulted in increased feelings of shame and loneliness and consequently resulted in social withdrawal.

'I don't see people, I don't go over to people, if people are having a dinner party, I won't go until after the dinner party because, I don't want to have to sit there, they put food on my plate, and either I sit there and have one or two mouthfuls and leave something and that will offend them, if you don't eat what's on your plate, the person's gone out of their way to cook for you, and you can't, and then you sit there, and people are saying 'oh, come on the least you could do is, you know, eat it' sort of thing. It's embarrassing cause nobody sort of thinks that you have an issue with food, they just think you're trying to diet, or, you can eat it. They don't assume that you can't eat it. So I don't go out to dinner anymore.' (Participant 1)

Desire for reward from food. However, the experience of loneliness resulted in a desire for reward from the experience of eating calorific foods to reduce negative affect.

'How would I describe it, filling a void, basically, the more you worry, and you're filling a void. You have to try and get some comfort from somewhere, and you know it, late at night, when you've put the kids to bed, and there is no one. That's when the chocolate and the biscuits provide comfort.' (Participant 5)

Participants' responses reflected that their mental health difficulties/negative affect led to a desire for reward from food and a desire for comfort, from the experience of eating to manage unpleasant emotional states.

'Once I get it in my head that I want something sweet, I'll just walk around the house until I find something. I purposely don't buy stuff to keep the house for that reason, so I don't eat it. But, if it's that strong I'll actually leave the house in the middle of the night and go to wherever I have to go to find something sweet to eat. Probably after I see a private psychiatrist and quite a few days after her sessions, I would just go to the shops and buy a whole heap of stuff and eat it.' (Participant 4)

Overeating/uncontrolled eating behaviours. From participants' descriptions it was apparent that the ongoing desire from reward from food resulted in over eating/uncontrolled eating behaviours.

'I suppose you'd even call it binge eating, because I couldn't keep anything in case my mother found it, so, I'd buy chocolate bars, eat them all in one go, and that came through to my adulthood, where if I bought a block of chocolate, I couldn't just let it sit there; I would have to eat it all and then hide the wrapper.' (Participant 11)

Participants reported that they were not able to control their eating behaviours**.**

'Some people might be very strong. But I've never been able to, where eating is concerned, I've always been embarrassed that I have never been able to control it.' (Participant 9)

Participants' responses reflected their inability to make behavioural changes with regards to their eating behaviours, and that they had an unrealistic expectation that the surgery itself would address their problematic eating behaviours.

'I just wish there was something, to have a surgery on the brain, to turn off because I don't seem to stop. Even that one mouthful too much and my tummy really hurts now and I can't seem to find that stop. I honestly expected to lose the weight and get rid of my problems. Simple as that. The weight, my food choices, the diabetes, the heart and all the rest of it. All the problems that I thought would be just fixed.' (Participant 6)

Change in taste and volume. Participants' responses reflected that they experienced taste changes post-bariatric surgery.

'I noticed taste changes after the surgery, and certain things that I ate before the surgery, I never went back to some foods and I lost my taste for seafood.' (Participant 2)

It was evident from participants' accounts that there was an unexpected change in their tastes and enjoyment of certain foods.

'It's actually changed my taste, sort of things. I never, ever thought that it would, but I've got to keep away from any sweet sort of stuff. And, you know, there are times when you just crave it, which I never did before. I would rather if I wanted some junky foodstuff, had a big packet of potato crisps, or something like that, but now I couldn't care less about them. Now I'd rather have something sweet, which is not good.' (Participant 3)

The unexpected experience of taste changes and the restriction in the ability to eat the volume of food, they had been able to eat prior to bariatric surgery, resulted in a gap between the anticipated and actual experience of reward from food. Consequently, participants reported that they mourned their prior relationship with food.

'And you just lose the taste, you can't eat much of it, and what you do eat of it you don't get any enjoyment out of it, because it's just hard work to get it down. I certainly can't eat as much and when I'm enjoying something, as I said, I should stop that one mouthful before I do. I miss the taste of some food.' (Participant 2)

Gap between anticipated and actual experience or reward from food. The gap between anticipated and actual experience of reward from food / loss leads to overeating/uncontrolled eating.

'Yeah, because you couldn't get it in, and that's what I needed. I still think I have too much. As I said, it's like I've got to eat till it hurts and then I stop and that's silly. I know I shouldn't. So it's like where some people go, 'Oh, I'm full.' My brain doesn't do that and it's pretty stressful.' (Participant 14)

Unsatisfactory outcome. Participants' responses reflected that bariatric surgery had not met their expectations and that they were not satisfied with the long-term outcome**.**

'Not that great, I don't think. I guess I was expecting more even with the whole bypass and revisional surgery. I was expecting to lose more weight. So I feel that I have not lost as much weight and I still have a lot of that hunger, I haven't particularly changed the types of food I eat and I feel like I am still eating bigger meals than what I should be able to considering the surgeries.' (Participant 4)

5.5 DISCUSSION

Currently, little is known about the causes of failure to reach or maintain EWL for the minority of patients whose primary LAGB procedure is unsuccessful and who have multiple revisional bariatric surgeries. This study aimed to understand from this cohort of patients the factors that they perceived had contributed to them not achieving or maintaining EWL from a primary LAGB surgery, leading to subsequent multiple revisional bariatric surgeries.

Participants consistently reported that they placed unrealistic expectations on the weight loss surgeries to address their long-term weight, health, social and eating difficulties. Participants' responses reflected an external locus of control in the belief that their weight difficulties and inability to achieve to EWL was due to factors outside of their control, and that the surgery would resolve their weight difficulties. Recent studies have indicated that participants with an internal locus of control generally demonstrated more positive health behaviours and were more successful in achieving their initial weight loss goals than

participants who had an external locus of control (Lefcourt, 2014). Locus of control is an important characteristic in relation to obesity because, as described above, it indicates whether an individual believes that the solution to obesity lies in his or her environment or the choices that are made by that individual (Neymotin & Nemzer, 2014).

Participants reported that they hoped the surgery would help them gain control of their eating behaviours. This finding is consistent with Ogden et al., (2005), findings where surgery was viewed as the last alternative to lose weight and as an important strategy to gain control of eating behaviour. Further, Kaly et al., (2008), concluded that bariatric patients had unrealistic expectations of the surgery and, similarly, Engström et al., (2011) concluded that weight loss surgery patients excluded themselves as part of the treatment and that they expected the surgery itself will give them control of their weight, eating behaviours and lives.

In addition to the perception in this study that bariatric surgery was the solution to their eating, health, weight and social difficulties, participants reported incidences of interpersonal trauma comprising both sexual and non sexual experiences. Other studies propose a relationship between sexual abuse and obesity, but especially with regard to weight regain after successful weight loss, sexual abuse may also have a crucial impact on the outcome of bariatric surgery (Steinig et al., 2012).

Studies on body image and obesity have reported elevated body image dissatisfaction in women seeking bariatric surgery (Grilo, Masheb, et al., 2005; Rosenberger, Henderson, & Grilo, 2006). A recent qualitative study with females post-bariatric surgery found that negative self evaluation was common in regards to body image distortion and body image satisfaction (Alegría & Larsen, 2015). Similarly, the participants in this study reported experiencing body image dissatisfaction.

There is a growing body of evidence that suggests that patients who are eligible for, or who present for bariatric surgery suffer from psychological distress. Numerous studies based upon structured diagnostic interviews indicate that bariatric surgery patients have a high prevalence rate of psychological disorders (Legenbauer et al., 2011). Onyike et al., (2003), found that morbidly obese individuals were five times more likely to be depressed compared to persons with average weight. Similarly to other studies, the participants in this study reported higher levels of depression, anxiety, and stress (Abiles et al., 2010). The participants reported mental health difficulties as a consequence of experiencing trauma and the repeated

experience of failure to achieve EWL and, thus, requiring revisional surgery increased emotional distress, social isolation and emotional eating or emotionally triggered eating.

RYGB was the most prevalent revisional surgery post-failed LAGB in this cohort of patients and is associated with decreased hedonic enjoyment of sweet or highly palatable foods (Ochner et al., 2011). Participants' reported an inability to experience satisfaction due to taste and volume changes which, in turn, increased their negative affect and perpetuated the maladaptive eating cycle. Thus, loss of control eating/overeating is a method of coping with the negative affect by providing comfort and is consistent with other studies where eating in response to emotional distress was reported by participants as a historical coping strategy that was still prevalent post-surgery (Fairburn et al., 2003). A sense of loss of control and overeating in response to emotions has been associated with difficulties adjusting to eating smaller volumes of food post-surgery (Poole et al., 2005; Saunders, 2001). Further, in this study emotional eating and loss of control eating as in other studies was indicated as a risk factor for not achieving EWL post-bariatric surgery (Fischer et al., 2007).

5.6 IMPLICATIONS

This study highlights the importance of the screening of bariatric patients, in particular those presenting for multiple revisional surgery, both before and periodically after surgery to identify those with an unrealistic expectation of weight loss surgery, experience of interpersonal trauma, tendency for emotional eating, experiencing loss of control eating and inadequate social support. Identified bariatric patients need support in developing adaptive coping strategies to assist with emotional eating and loss of control eating behaviour. Patients need to be educated on the requirement of behavioural changes regarding the choices of high caloric foods and possible taste changes to achieve success and maintain weight in the longer-term and be informed of the possible negative impact of weight homeostasis on the rate of weight loss post-revisional and multiple revisional bariatric surgeries. In addition, the psychological distress of having revisional bariatric surgery to remediate weight loss should not be underestimated.

5.7 LIMITATIONS OF THIS STUDY

Conclusions drawn from this study are limited as the 17 participants are all female, are a cohort of multiple revisional bariatric surgery patients and are from the same ethnic background and the same region. Additionally, not all of the participants in this study were

the primary and, in some cases, revisional patients of the surgeons at either site but were referred to these clinics for revisional surgery.

5.8 CONCLUSION

Majority of patients achieve EWL after undergoing bariatric surgery and the number of patients who experience weight recidivism and have agreed to have revisional and multiple surgery is a relatively small proportion of the bariatric surgery patient population. This study suggests four important psychosocial vulnerabilities that may be present in these patients who failed to achieve or maintain EWL and consequently `had multiple revisional bariatric surgeries: unrealistic expectations of weight loss surgery, historical interpersonal trauma, loss of control eating as primary coping strategy to cope with negative affect, and diminished enjoyment of food due to changes in taste and volume. The findings of this qualitative study may guide clinicians in the identifying and supporting of at-risk revisional bariatric surgery patients, aiming for a greater understanding of their psychosocial presentation and thus improving long-term outcomes.

5.9 FUNDING

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sector.

5.10 CONFLICT OF INTEREST STATEMENT

No conflict of interest has been declared by the authors.

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Chapter 6: Introduction to Study 3

6.1 OVERVIEW

This programme of research examined the role of patients' psychosocial factors in relation to excess weight loss (EWL) following bariatric surgery. As described in Chapter 3, this research was undertaken in two phases. Phase 1 involved two qualitative studies, Studies 1 and 2, which utilised a Grounded Theory methodology to develop, inductively, a theoretical model of psychosocial factors and their contribution to participants' failure to achieve EWL. At the time of the interviews, these participants had elected to have revisional (Study 1) and multiple revisional (Study 2) bariatric surgeries, following their failure to achieve EWL after a primary Laparoscopic Adjustable Gastric Banding (LAGB) procedure. The findings of the qualitative Studies 1 and 2 were reported in Chapters 4 and 5 and were the foundation for the quantitative study, Study 3.

The purpose of Phase 2 of this programme of study was to examine the degree to which the psychosocial factors identified in Phase 1 were useful in predicting patients' early weight loss trajectories after a primary bariatric procedure for a new cohort of participants. Thus, Phase 2, which involved Study 3, a quantitative study, utilised a longitudinal design to investigate the psychosocial factors identified in Phase 1 by examining the experiences of primary bariatric surgery patients. This study also provided opportunities to gather further information regarding the role of psychosocial factors in relation to EWL. However, the quantitative, self-report survey design of Study 3 was not suitable for examining all of the factors identified in Phase 1. In addition, factors that were not identified in Phase 1, but were identified in the literature, were also included in Phase 2. The findings from Study 3 are reported in Chapters 7 and 8. The purpose of this chapter is to provide a rationale for the psychosocial factors included in Phase 2 and to present the working model (section 6.6).

It is also important to note that recent developments in bariatric surgery procedures have resulted in a change in the types of surgical procedures performed and these changes occurred in the time between reporting the primary surgical procedures of participants in Phase 1 and of those in Phase 2. Participants in Phase 1 had undergone a primary LAGB procedure; most participants in Phase 2 elected to have a Laparoscopic Sleeve Gastrectomy (LSG), with only a small number of participants electing to undergo a LAGB. A summary of

these developments in recent surgical practice are described in Section 6.1.1. In addition, a discussion of the researcher's response to the heterogeneous surgical procedures of participants in Study 3 is presented in Section 6.1.2

6.1.1 Summary of Recent Surgical Developments in Bariatric Surgery

Until recently, the laparoscopic Roux-en-Y gastric bypass (RYGB) was considered the gold standard intervention for obesity as it had the most robust results for positive long-term clinical outcomes. However, the laparoscopic sleeve gastrectomy (LSG) has now attained the status of a valid alternative to RYGB, and importantly is now regarded as superior to the LAGB in the hierarchy of bariatric surgical interventions (Nedelcu et al., 2015). In contrast to the LAGB's restrictive nature regarding the limited textures and food types, LSG patients (4 to 6 weeks postoperatively) should be able to eat ¼ to ½ cup of a variety of food types and textures 5 to 6 times per day (M. Graham, Personal communication, August 23, 2013). LAGB patients are able to eat a similar volume of food but the restrictive nature of the band limits the texture and, thus, variety of foods. Further, the LSG offers a better quality of life over gastric banding as a result of this more normalized eating pattern (Noel et al., 2014). Moreover, the LSG is perceived as less invasive, is technically simpler, and is easier to perform when compared to the RYGB. Also validating this clinical shift from the LAGB to the LSG, a meta-analysis which compared the outcomes of LAGB and LSG in terms of EWL concluded that the LSG had a greater effect on morbid obesity in terms of EWL (Wang et al., 2013). Consequently, the LSG is the now the most frequently used procedure for weight-loss surgery in USA and Australia, and is a promising bariatric procedure that provides effective weight loss and the resolution of co-morbidities (Australian Goverment, 2015; Farrell et al., 2009). The participants in the qualitative studies had a primary LAGB; however, the majority of participants in Study 3 had a LSG and the demographics were reflective of the LSG procedure now being the most popular procedure being performed worldwide and in Australia (Australian Government, Medicare Data, 2015).

6.1.2 Study 3 Participants' Heterogeneous Surgical Procedures

Although 132 participants initially took part in Study 3, and 114 participants completed the measures at both time points, eight of these participants were excluded as they had undergone a primary LAGB or RYGB. These eight participants were excluded to facilitate a homogeneous sample group in terms of bariatric procedure. This exclusion was deemed important to control for the possible confounding influence of any differences in EWL that

might be due to type of procedure, rather than due to psychosocial factors. Thus, the 106 participants who were included had the same type of bariatric procedure, namely the LSG. Further, in selecting only LSG patients, the participant demographics reflect the population of people who currently elect to have bariatric surgery, with the LSG procedure now being the most frequent bariatric procedure being performed worldwide and in Australia (Australian Government, Medicare Data, 2015).

6.2 DEVELOPING A WORKING MODEL FOR INVESTIGATION IN PHASE 2

6.2.1 Psychosocial Factors Identified in Phase 1

In Study 1 following the grounded theory analysis of the 23 interviews, a model emerged with core category of, "unrealistic expectations of LAGB" and five conceptual categories: restriction of band, impacts on social interactions, desire for food choices that give reward, increase in consumption of high calorie dense food choices because of texture and reward, and shame, loneliness and loss. In Study 2, 12 key factors represented the participants' experiences of revisional bariatric surgery. A model emerged, grounded in the data, with the core category of, "unrealistic expectations of weight loss surgery" and 11 conceptual categories: interpersonal trauma; unattractive body image as a protection against further emotional and sexual abuse; mental health difficulties; negative affect (shame and loneliness); failure of past surgeries; lack of social support; desire for reward from food; revisional weight loss surgery; change in taste; gap between anticipated and actual experience of reward from food; over eating/uncontrolled eating, and perceived unsatisfactory outcome.

6.2.2 Factors Identified in the Literature

A working model was developed by utilising the conceptual categories explicated from Phase 1 of the program of research and then relating these categories to the broader literature and involved the processes of comparing, contrasting, and abductive reasoning. The working model was developed from the constructs identified from Phase 1 of the program of research and with reference to existing constructs in this field of research and included: locus of control, social support, changes in perception of taste, eating behaviours, mental health and activity levels. Thus, the working model was developed from both Study 1 and Study 2 and through examining the broader literature. It was hypothesized that the constructs of the working model which included: locus of control, social support, changes in perception of taste, eating behaviours, mental health, and activity levels may be associated with greater

weight loss outcome at 6 months post primary bariatric surgery. Figure 6.1 shows the process for the development of the working model.

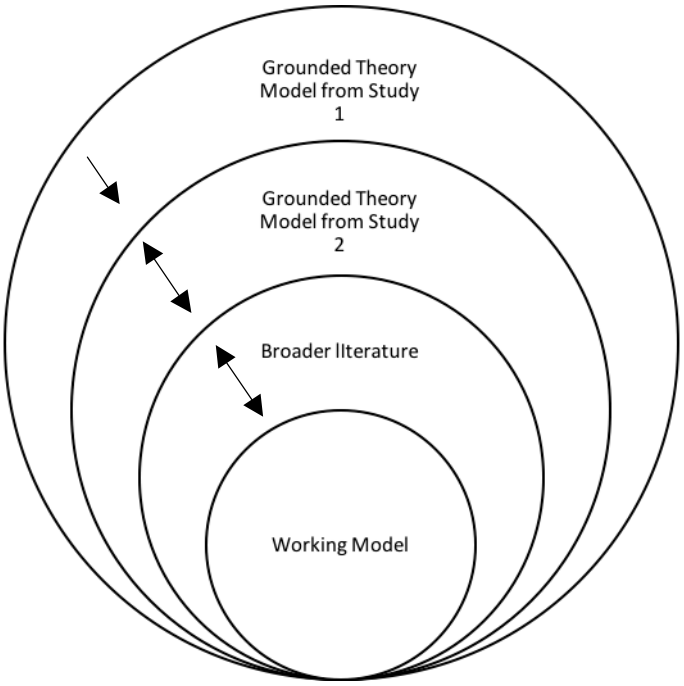

Figure 6.1. Development of the Working Model

6.2.3 Included Factors

Locus of Control

In the models developed from Studies 1 and 2, "unrealistic expectations of LAGB" and "unrealistic expectations of bariatric surgery" were the core categories, respectively. Participants' responses, which led to the development of these core categories, described expectations that bariatric surgery was their last hope, and that they had tried everything else and failed. For these participants, bariatric surgery was seen as a miracle cure, and in a way that placed the patient struggling with obesity in a passive role, as receiving this cure, rather than participating in it. The findings from Studies 1 and 2 are similar in terms of the construct of locus of control and taken together, they suggest that patients presenting for revisional and multiple revisional bariatric surgeries have an unrealistic expectation of bariatric surgery. Revisional bariatric surgery patients had an expectation that bariatric surgery was the panacea to all their difficulties across a number of domains. Thus, there is an expectation that the

surgery itself will make the necessary changes that will result in lifestyle and behavioural changes to achieve weight loss, but most importantly, to maintain weight loss after bariatric surgery. Consequently, these core categories can also be seen as describing the participant's beliefs regarding locus of control, in relation to obesity, as external.

According to other studies, locus of control is an important characteristic in relation to obesity because it indicates whether an individual believes that the solution to obesity lies in his or her environment or in the choices that they make (Neymotin & Nemzer, 2014). In a prior study, patients struggling with obesity attributed their weight difficulties to internal uncontrollable factors, such as genetics and hormones (Ogden et al., 2005). Similarly, in a longitudinal study of bariatric patients who had not achieved >50 % EWL at 12 months' post surgery, Da Silva & da Costa Maia found that patients were still expecting a miracle surgery that didn't involve their personal commitment to facilitate change. In contrast, those who had achieved EWL understood that bariatric surgery was an important moment in their lives related to their weight loss results and that their commitment to change following surgery was also required (da Silva & da Costa Maia, 2012b). In their recommendations, Da Silva et al. recommended that bariatric patients be screened for locus of control, prior to surgery. The similarities between the findings of the prior qualitative Studies 1 and 2 and Da Silva et al.'s recommendations indicate that locus of control is an important factor in patients' achievement of EWL following bariatric surgery. Thus, locus of control was included in the working model for Phase 2, and hypothesised to have a positive relationship with EWL such that higher internal locus of control should predict greater EWL.

Measuring Locus of Control

Rotter's Internal-External Locus of Control is a validated scale that has been used extensively (Sonntag et al., 2010). However, health-related locus of control has been found to be a better predictor for weight change than a general locus of control measures (Sonntag et al., 2010). The Internal versus External Control of Weight Scale (IECW) is a specific measure a person's locus of control pertaining to weight loss (Tobias & MacDonald, 1977). The scale was initially developed to test the effectiveness of internal perception to facilitate weight reduction. The instrument is relevant to weight reduction treatment in that it targets how clients do or do not take responsibility for their treatment and was developed from participants who expressed a belief that their weight problem was related to eating and activity patterns and had declared a desire to change. The descriptions of external locus of control emphasise hereditary or physiological factors, external motivation, reliance on

medications, uncontrollable hunger, and early childhood experiences. The descriptions of internal locus of control emphasise the importance of self control, internal motivation, the subjectivity of hunger and the role of poor eating habits. These descriptions are very similar to participants' responses that contributed to the category "unrealistic expectations" ("unrealistic expectations of LAGB" in Study 1 and "Unrealistic expectations of surgery" in Study 2). Therefore, in Study 3, the IECW was used to investigate the construct "unrealistic expectations" as it is relevant to expectations of weight loss surgery in that it emphasises clients taking responsibility for their weight loss trajectory.

Social Support

The Grounded Theory models from Study 1 and 2 identified forms of social support as being important, and the participants in both studies identified a lack of perceived social support as contributing to unsatisfactory weight loss and to poor psychosocial outcomes. In Study 1, the LAGB affected participants in the social domain: for example, they were not able to socialize by going out to dinner and, thus, the LAGB had a negative impact on their relationships with family and friends. The participants' responses in Study 1 reflected that the restriction of the LAGB was a significant factor in inhibiting their ability to socialise in that they engaged less socially, felt excluded, and that the quality of their relationships diminished. Similarly, in Study 2 the participants' responses reflected their experience of lack of perceived social support as they reported that they felt isolated in their experience of having multiple revisional surgeries. In Study 1, the consequence of not being able to eat out socially and the experience of feelings of loneliness resulted in feelings of social deprivation and exclusion. Correspondingly, in the multiple revisional study (Study 2), the experience of perceived lack of social support resulted in increased feelings of shame and loneliness and consequently resulted in social withdrawal. These responses from both qualitative studies led to the development of the conceptual categories: impacts social interactions, lack of social engagement, and lack of perceived emotional and family support, which are reflective of the construct of social support. The similarities between the constructs of social support from Study 1 and Study 2 are pronounced.

Social support is an important component of successful lifestyle changes and individuals with higher levels of social support achieve greater success in long term weight maintenance (Klem et al., 2000). In prior studies of bariatric surgery and the effects of social support, Vishne et al. (2004) have suggested that family and social support may increase the weight loss following surgery by helping patients to deal with psychosocial stressors and

dietary changes. Further, Ray et al. (2003) found that bariatric patients have an average baseline of four confidants, and those with greater than nine confidants trended towards greater weight loss ($p = 0.13$). The similarities between the findings of the prior qualitative studies and these studies are clear in that participants in both qualitative studies identified their lack of perceived support as contributing to their unsuccessful outcomes. A more recent review article examined the impact of post-operative support groups and other forms of social support on weight loss after bariatric surgery (Livhits et al., 2011). Livhits et al.'s review found that support group attendance post weight loss surgery was related to greater post-operative weight loss. However, these findings are not aligned with the findings in Phase 1, as support group attendance was not identified by the participants of Study 1 and 2 as being important. The findings from Studies 1 and 2 suggest that the participants in Phase 1 of this program of research experienced a perceived lack of support from friends and family.

Although Livhits et al. (2011) identify ways in which social support facilitates weight loss outcomes, the focus of this program of research was on factors that predict failure to achieve EWL in order to identify the need for intervention. While post-operative support groups may be offer support as a means of intervention, what is being targeted in this program of research is patients' perceptions of lack of support, which Phase 1 highlighted is expected to be received from friends and family. Therefore, this aspect, the social support of family and friends, was included in the working model for Phase 2, and hypothesised to have a positive relationship with EWL such that greater perceptions of social support should predict greater EWL.

Measuring Social Support

The most widely used measure of social support is the Inventory of Socially Supportive Behaviours (Gottlieb & Bergen, 2010). However, according to Gottlieb and Bergen (2010) the Inventory of Socially Supportive Behaviours is vulnerable to problems of over and under inclusion of types of support and to contexts. In particular, for this study the context was deemed unsuitable as it measures perceptions of support in the preceding month and the construct elicited from Phase 1 of the study was over an extended period of time. However, the 2-Way Social Support Scale (Shakespeare-Finch & Obst, 2011) has no time constraints and measures the giving and receiving of instrumental and emotional social support. Therefore, the 2-Way Social Support Scale was chosen a measure to investigate the constructs of impacts social interactions, lack of social engagement, lack of perceived

emotional and family support. These constructs are reflective of the construct of social support from the qualitative studies.

Change in perception of taste

The qualitative studies identified changes in perception of taste, desire, and enjoyment of food as contributing to an unsuccessful outcome following revisional and multiple revisional weight loss surgeries. Participants' responses about experiencing these changes in taste led to the development of the conceptual categories: desire for taste of high calorie foods, change in taste and volume, gap between anticipated and actual reward from food, and were dissatisfied with the process of eating. In Study 2, the participants reported the unexpected experience of taste changes and lack of enjoyment from the eating process and the restriction in the ability to eat the volume of food they had been able to eat prior to bariatric surgery resulted in a gap between the anticipated and actual experience of reward from food. Consequently, participants reported that they mourned their prior relationship with food. The participants identified that the gap between their anticipated and actual experience of reward from food contributed to their overeating/uncontrolled eating behaviours.

In both qualitative studies, participants described an increased desire for calorie dense foods with specific textures and taste. Other studies have similarly suggested that people struggling with obesity report higher hedonic hunger and higher enjoyment for sweetness and fatty tastes compared with normal weight participants (Bartoshuk et al., 2006). Taste has been identified in a prior study as an important factor governing eating behaviour as it contributes to food preference and is also thought to modulate appetite and caloric intake (Berthoud & Zheng, 2012). Further, most patients (83% of RYGB) agreed the loss of taste resulted in better weight loss outcome and those who experienced food aversions had more postoperative weight loss compared to their counterparts without such aversions (Tichansky, Boughter, & Madan, 2006). Previous studies have not investigated desire, enjoyment, and taste changes in bariatric surgery patients. These constructs were identified in the prior qualitative studies as being important in contributing to food preferences, enjoyment of food, maladaptive eating behaviours and, ultimately, an unsuccessful weight outcome. Thus desire, enjoyment and taste changes were included in the working model for Phase 2, and hypothesised to have a positive relationship with EWL in that greater degrees of change should be associated with achieving a greater EWL.

Measuring taste, desire and enjoyment change

As an appropriate validated measure was not available to investigate the changes in perception of taste post-bariatric surgery, the study specific Taste, Desire and Enjoyment Questionnaire Scale (TDEQS) was developed for this program of research to investigate this construct in Phase 2. The TDESQ measures the degree that tastes, desires, and enjoyment for certain foods or liquids have changed or stayed the same since undergoing bariatric surgery.

Eating behaviours

In both qualitative studies, participants reported a sense of loss of control with eating and overeating in response to emotions which led to the conceptual categories: eating because of emotional reasons (negative affect-shame, loneliness, loss), over eating, uncontrolled eating, desire for reward from food, increased consumption of high calorific foods because of texture or reward desire for taste of high calorie foods, and a gap between anticipated and actual reward from food.

In Study 1, the restrictive nature of the band facilitated the development of maladaptive eating and drinking patterns. This experience was compounded by a desire for comfort or reward from food, resulting in an increased consumption of calorific foods because of their texture. However, in Study 2 participants' responses reflected that their mental health difficulties/negative affect led to a desire for reward from food and a desire for comfort from the experience of eating to manage unpleasant emotional states. From participants' descriptions, it was apparent that the ongoing desire from reward from food resulted in over eating/uncontrolled eating behaviour and participants reported that they were not able to control their eating behaviours. The inclusion of these Phase 1 findings in Phase 2 of this program of research is addressed in the following section "Mental health difficulties".

According to another study, emotional eating is anticipated to be present in 38% of bariatric surgery candidates (Miller-Matero et al., 2014), and a sense of loss of control and overeating in response to emotions has been associated with difficulties adjusting to eating smaller volumes of food post-bariatric surgery (Poole et al., 2005; Saunders, 2004). Maladaptive eating behaviours post-surgery such as a loss of control eating (Marino et al., 2012), emotional eating (Bocchieri et al., 2002a), and sweet eating (Burgmer et al., 2005a) have also been associated with poor weight outcome post-bariatric surgery. The similarities between the findings regarding overeating in repose to emotions and a sense of loss of control and the desire for high calorific sweet foods in the above studies and the prior qualitative studies are pronounced. Some maladaptive eating behaviours have been studied within the bariatric population and have been shown to have some predictive ability in respect to post-

surgical weight loss (Crowley et al., 2012). Other eating behaviours (e.g., food cravings) have not been extensively studied. However, some findings suggests episodes of overeating may be precipitated by food cravings and food-related cues (Jarosz et al., 2007). The cravings for food are strong or intense physiological or psychological desires that encourage the quest for and eating of a particular food (Cepeda-Benito et al., 2001). Similarly Study 2 identified the perceived experience of a gap between the anticipated and actual experience of reward from food contributed to overeating/uncontrolled eating behaviours and that participants reported that they still had cravings or desires for food post bariatric surgery. The eating behaviour constructs explicated from the qualitative studies were multifactorial and included: over eating, uncontrolled eating, desire for reward from food, and increased consumption of high calorific foods because of texture or reward. Thus, eating behaviours were included in the working model for Phase 2 and hypothesised to have a relationship with EWL such that maladaptive eating-behaviours, including uncontrolled-eating, seeking reward from food, and including relief from negative emotional states, should predict a lower EWL.

Measuring eating behaviours

The Food Cravings Questionnaire (FCQ-T), which is a multidimensional questionnaire, was chosen as it investigates eating behaviours that are not disordered in nature, but that may be associated with a range of negative eating-related choices post-operatively in bariatric surgery patients. The maladaptive eating behaviours identified in Phase 2 were identified as multidimensional, associated with each other, complex in nature and included: over-eating, uncontrolled-eating, desire for reward from food, increased consumption of high-calorific foods because of texture or reward, seeking reward from food, and including relief from negative emotional states. Thus, all the nine dimensions of the FCQ-T were included: intentions to consume food, anticipation of positive reinforcement, relief from negative states, lack of control over eating, preoccupation with food, hunger, emotions, cues that trigger cravings, and guilt.

Additionally, the emotional eating scale of the Three Factor Eating Questionnaire (TFEQ-R18) was utilised in Phase 2 of this programme of study to specifically examine: eating because of emotional reasons (negative affect-shame, loneliness, loss) identified in both study 1 and 2. Table 6.1 lists the specific eating behaviour constructs elicited from the Phase 1, Grounded Theory models (Studies 1 and 2) and the measures that were chosen to investigate these constructs.

Restriction from LAGB

The construct restriction of the band was identified in Study 1 as participants' responses reflected that the restriction of the LAGB was a significant factor in that it not only inhibited participants' ability to socialise but limited and dictated food choices and thus facilitated the development of maladaptive eating patterns. It was apparent from the participants' descriptions that the restriction, which is the function of the band, led to participants feeling deprived of the ability to eat certain foods and that, in response to that deprivation, there was an increased desire for reward foods, such as ice cream and chocolate (both high in calories), which were described as comfort foods. This construct was not fully explored in Phase 2 of the program of research as it was expected that only a small number of the participants would be LAGB patients, for reasons described in Section 6.2. However, the construct does identify a broader issue of dissatisfaction with eating behaviours post bariatric surgery. Thus, satisfaction with eating behaviour was measured to address this broader issue and included in the working model for Phase 2. It was hypothesised to have a positive relationship with EWL such that higher satisfaction with eating should predict a greater EWL.

Measuring eating dissatisfaction

The Quality of Alimentation questionnaire was chosen as it is a recognised tool for assessing food tolerance in bariatric patients and was used to evaluate the overall patient satisfaction regarding the quality of eating behaviours post primary bariatric surgery (Suter et al., 2007)

Mental health difficulties

The findings of the qualitative studies in Phase 1 of this program of research also suggested that participants had experienced mental health difficulties. The participants' responses in Study 2 reflected that they had a history of mental health difficulties and that their prior mental health difficulties were exacerbated by the experience of failure of not achieving a satisfactory weight loss outcome, and this led to them experiencing increased negative affect. Correspondingly, participants in Study 1 reported increased negative affect as a consequence of failure to achieve or maintain expected weight loss. Numerous studies based upon structured diagnostic interviews indicate that bariatric surgery patients have a high prevalence rate of psychological disorders (Kalarchian et al., 2007; Legenbauer et al., 2009; Legenbauer et al., 2011; Rosik, 2005). Further, recent evidence suggests that obese bariatric surgery patients report higher levels of depression, anxiety, and stress than people of normal weight (Abiles et al., 2010).The similarities between the findings of the above studies

and the findings of the qualitative studies were evident. Thus, mental health was included in the working model for Phase 2, and hypothesised to have a relationship with EWL in that mental health difficulties should predict lower EWL.

Measuring mental health difficulties

To address mental health difficulties, the MHI-5 (Berwick et al., 1991) was chosen. The MHI-5 is originally designed to assess anxiety, depression, loss of behavioural or emotional control, and psychological well-being in different subgroups and across various cultures (van den Beukel et al., 2012). The MHI-5 assesses symptoms of psychological distress, which made it suitable for use to investigate the constructs of mental health difficulties and increased negative affect explicated from Study 1 and 2 respectively.

6.2.4 Excluded Factors

Interpersonal Trauma

The findings of Study 2 identified that, for participants who had experienced interpersonal trauma, an unattractive body image was perceived as a protection against further sexual or emotional abuse. Interpersonal trauma was not identified as an important factor in Study 1. The findings of Study 2, in contrast to Study 1, in identifying interpersonal trauma and prior mental health difficulties as only present in the multiple revisional group, concurred with other researchers' findings that obesity can be regarded as an adaptive defence or self-protecting mechanism (Ray et al., 2003; Wiederman et al., 1999). Specifically, in Study 2 the participants who were interpersonal abuse survivors perceived their additional weight as protection from potential sexual advances. The participants' responses in Study 2 also identified that the experience of interpersonal trauma as a child or adult resulted in the experience of mental health difficulties. The participants' responses indicated that the prior mental health difficulties were exacerbated by the experience of failure of not achieving a satisfactory weight loss outcome and, consequently, this led to them experiencing increased negative affect. This experience created a distorted relationship with their weight, viewing it both as a form of protection, but also as a measure of personal failure. However, participants in Study 1 did not identify interpersonal trauma and, therefore, obesity as a defence mechanism.

Although interpersonal trauma was identified as an important construct in Study 2, it was not deemed appropriate to investigate as a predictor variable in Study 3. Given the

design of the study (i.e., an online survey), it was not possible to provide the appropriate support to those participants who may have become distressed in recounting their experience of interpersonal trauma. Thus, because of the sensitive nature of the construct and the limitations of the design, it was not included in Phase 2 of the program of study. However, this important construct, identified in the qualitative studies as a factor contributing to an unsatisfactory psychosocial and weight loss outcome post-revisional and multiple revisional bariatric surgery, should be examined in future studies of primary bariatric patients.

Physical activity

Although the role of physical activity has been clearly demonstrated in the literature in its importance in losing and maintaining weight loss post-bariatric surgery, this program of research did not explore the role of physical activity as it was not identified by participants in the qualitative studies as a construct contributing to weight loss outcomes.

Another important reason for excluding physical activity from Phase 2 of this program of research is that, at the time of Study 3, participants would not have returned to physical activity. Following bariatric surgery, patients are not encouraged to resume physical activity until 6-8 weeks after surgery (Dr Phil Lockie, Personal communication, August 23, 2013).

Negative affect (shame and loneliness and loss)

In Study 1, in contrast to the initial hopes and expectations of the LAGB being a miracle cure, participants reported a feeling of shame with regards to not achieving EWL and then having a revisional procedure. Similarly, in Study 2, the experience of failure of not achieving a satisfactory weight loss outcome contributed to feelings of shame and the experience of loneliness. In Study 2, participants' responses reflected that their mental health difficulties/negative affect led to a desire for reward from food and a desire for comfort, from the experience of eating to manage unpleasant emotional states. Correspondingly, the conceptual category in Study 1, shame/loneliness/loss had a bidirectional relationship with categories: desire for reward from food choices, and impacts on social interactions. Participants reported that increased negative affect, including grief, loss, shame and loneliness, precipitated emotional eating and they described eating specific textured calorific foods as a coping strategy to deal with negative affect. These constructs were not explored in Phase 2 of the program of research as participants would not have been identified as experiencing failure to achieve EWL by their medical teams at either times of completing the measures. However, the construct of emotional eating was chosen to explore the association

with negative affect and eating behaviours. The emotional eating scale of the Three Factor Eating Questionnaire (TFEQ-R18) was utilised in Phase 2 of this programme of study to specifically examine emotional eating behaviours post bariatric surgery as described in the prior section "Eating behaviours".

Maintenance of unattractive body image

In Study 2, participants' responses reflected that eating was utilised to increase their body weight and, thus, the maintenance of an unattractive body image was perceived by some participants as a protective mechanism against unwanted sexual interaction. Participants reported that the increase in body weight was perceived as a protective measure against further sexual abuse in that they were subjected to abuse at a certain weight and, thus, losing weight resulted in feelings of being vulnerable and exposed. Consequently, being a heavier weight was perceived as a shield or protective measure. The findings concerning changes in body image after bariatric surgery have been inconsistent (Teufel et al., 2012). Partial improvement has been reported post-LAGB in some studies in the first 2 years post surgery. (De Panfilis et al., 2007; van Hout, Fortuin, et al., 2008; van Hout, Vreeswijk, et al., 2008). Thus, because of Study 3's timeframe and sample size, it was not included in Phase 2 of the program of study. However, this important construct, identified in the qualitative Study 2 as a factor contributing to an unsatisfactory psychosocial and weight loss outcome post-multiple revisional bariatric surgery, should be examined in future studies of primary and revisional bariatric patients.

Failure of past surgeries

The construct failure of past surgeries was not explored in Phase 2 of the program of study as the participants had all undergone primary a bariatric procedure. However, this important construct, identified in the qualitative Study 1 and 2 as a factor contributing to an unsatisfactory psychosocial and weight loss outcome post-revisional and multiple revisional bariatric surgery should be examined in future studies of revisional and multiple revisional bariatric surgery patients.

6.2.5 Summary of the Working Model

The previous sections have provided a rationale for the inclusion and exclusion of psychosocial factors related to EWL. Figure 6.2 summarises the model.

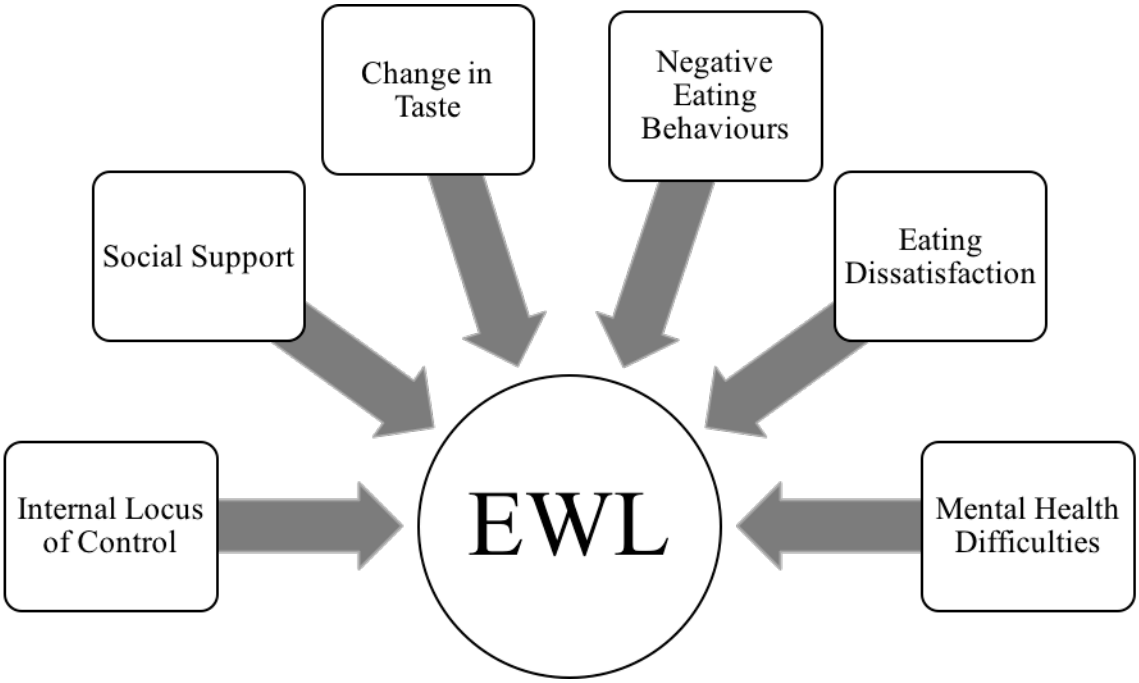

Figure 6.2. Summary of Working Model

6.3 THE WORKING MODEL AND STUDY 3 MEASURES

It was hypothesized that the constructs locus of control, social support, changes in perception of taste, eating behaviours and mental health may be associated with weight loss outcome at 6 months post primary bariatric surgery. Study 3 utilised change in weight loss outcome as the dependent variable as this was identified as important in the prior qualitative studies and is the primarily utilised outcome measure in the bariatric research literature. Table 6.1 lists the constructs elicited from the Phase 1, Grounded Theory models (Studies 1 and 2) and from the review of the literature together with the variables and the respective measures which were chosen to represent these constructs in the quantitative stage of investigation (Phase 2: Study 3).

Table 6.1:

Summary of Working Model and Study 3 Measures

Phase 1: Grounded Theory Models	Phase 2: Working Model	Study 3 Measures
Locus of Control **Studies 1 & 2** **Unrealistic expectations of weight loss surgery**	Degree to which respondents consider the achievement of a goal contingent or non contingent on their own behaviour - locus of control	Internal versus External control of weight scale
Social Support **Study 1** **Impacts social interactions** **Study 2** **Lack of social engagement** **Lack of perceived emotional and family support**	Level of emotional /social support	The 2 Way Social Support Scale
Change in Taste **Study 1** **Desire for taste of high calorie foods** **Study 2** **Desire for reward from food** **Change in taste**	Change in taste sensitivity Change in desire for foods Change in enjoyment of food	Changes in Taste Desire and Enjoyment Scale Questionnaire
Eating Behaviours **Study 2** **Change in volume** **Eating because of emotional reasons, over eating, uncontrolled eating,** **Gap between anticipated reward from food** **Studies 1 & 2** **Food choices that give reward** **Eating in response to emotional distress**	Satisfaction with eating behaviours Eating for emotional reasons Loss of control over eating Food choices that give reward Food as an addiction Cravings for food	Quality of alimentation questionnaire Food cravings questionnaire-Trait Three factor eating Questionnaire- R18
Mental Health **Studies 1 & 2** **Mental Health Difficulties**	Mental Health	Mental Health Inventory-5
Physical activity **Not identified by participants in Study 1 and 2 but important in the literature**		Baecke Physical Activity Scale

A much larger sample size was needed to test for all the sub-scales identified and, therefore, a series of correlational analyses was conducted to refine the number of proposed predictors. Consequently, the series of correlational analyses was undertaken in an exploratory manner to identify the relationships among the potential constructs and EWL in order to identify those factors most likely associated with the outcome variable. Based on

these correlational results, the model would be refined to enable a more focussed examination of the constructs associated with EWL among this cohort of primary bariatric surgery patients. Given the design of the longitudinal study and the time constraints of the program of research, it was not possible to recruit additional participants to complete both sets of measures 6 months apart. Thus, the results of Study 3, with data from 106 participants, have been interpreted with caution. The participant characteristics of Study 3 are presented in Table 6.2

Table 6.2: Participant Characteristics

Characteristic	Value
Patients (n)	106
Mean age (yr.)	42 (*SD* 10.72)
Female (%)	81
Mean BMI (kg/m^2)	44 (*SD* 7.35)
Mean %EWL at 6 months	64 (*SD* 21)
Mean %TWL at 6 months	26 (*SD* 5.88)
Working Status (%)	80
Employed	20
Not working	
Level of Education (%)	30
High School	27
Post-High school	42
University	
Marital Status (%)	
Married	42
Defacto / In a relationship	27
Single	19
Divorced	4
Widowed	3

BMI = body mass index; % EWL = percentage of excess weight loss; %TWL= percentage of total weight loss. Data presented as mean with standard deviation, unless noted otherwise.

6.3.1 Modifications to the Working Model arising from Study 3 Results

Locus of Control, Physical Activity, Mental Health and Social Support

In the initial, exploratory bivariate correlations with weight loss outcome at 6 months post-LSG, the constructs of locus of control, physical activity, mental health, and perceived social support did not reach statistical significance. Results of these analyses are presented in Table 6.3. These variables and the possible reasons for non-significant findings are explored in the Discussion Chapter. However, these are important constructs identified in the qualitative studies as factors contributing to an unsatisfactory psychosocial and weight loss

outcome post-revisional and multiple revisional bariatric surgery. Therefore, these constructs should be examined in future studies of primary bariatric patients.

Table 6.3:

Initial Correlations Table of % EWL and Constructs

	%EWL	1	2	3	4	5
1 Locus of Control	-.04					
2 MHI-5	.09	.10				
2-Way Social Support Scale						
3 Emotional Support	.04	.04	.10			
4 Instrumental Support	.01	.04	-.03	.78***		
Baecke Questionnaire						
5 Walking Score	.08	-.18	-.04	-.11	-.01	
6 Standing Score	-.10	.13	.10	.07	.06	-.72***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Change in Taste – Physiological Factors

Phase 1 of this program of research (Studies 1 and 2) identified that satisfaction with eating and unexpected changes in tastes and desires for specific foods and, therefore, diminished enjoyment of food as factors contributing to participants' unsatisfactory weight loss and psychosocial outcome. Additionally, the qualitative studies identified an increased desire post-LAGB for specific foods, such as ice cream and chocolate (both high in calories and sweet and fatty in flavours). In the initial exploratory bivariate correlations with percentage excess weight loss outcome (% EWL) and changes in the perception of Taste,

Desire and Enjoyment of flavours at 6 months post-LSG, changes in savoury desire reached statistical significance. Results of these analyses are presented in Tables 6.4, 6.5, and 6.6. Further analysis of these physiological patient-reported factors of satisfaction with eating behaviour and the change in taste perception, as well as desire, and enjoyment of flavours in relation to post-surgery weight loss in a primary LSG cohort, are examined in Chapter 7 which presents these findings as Study 3a.

Table 6.4:

Initial Correlations Table of % EWL and Flavour Change at 4 – 6 weeks post-surgery

	%EWL	1	2	3	4	5	6	7
1. Sugar	.16							
2. Salty	.00	.45***						
3. Sour	.01	.47***	.57***					
4. Spicy	.08	.44***	.55***	.60***				
5. Fatty	-.03	.33**	.43***	.56***	.42***			
6. Savoury	-.01	.32**	.51***	.45***	.41***	.37***		
7. Bitter	.00	.44***	.49***	.66***	.71***	.48***	.53***	
8. Metallic	-.05	.29**	.42***	.31**	.33**	.25*	.41***	.35***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 6.5:

Initial Correlations Table of % EWL and Desire Change at 4 – 6 weeks post-surgery

	%EWL	1	2	3	4	5	6	7
1. Sugar	-.05							
2. Salty	-.12	.00						
3. Sour	.06	.31**	.32**					
4. Spicy	-.03	.17	.26**	.56***				
5. Fatty	-.08	.55***	.03	.46***	.25*			
6. Savoury	-.12	-.01	1.00***	.31**	.26**	.03		
7. Bitter	.17	.24*	.24*	.68***	.49***	.37***	.24*	
8. Metallic	.13	.27**	.07	.35***	.19	.39***	.07	.49***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 6.6:

Initial Correlations Table of % EWL and Enjoyment change at 4 – 6 weeks post-surgery

	%EWL	1	2	3	4	5	6	7
1. Sugar	.10							
2. Salty	-.07	-.01						
3. Sour	.08	.27**	.16					
4. Spicy	.06	.17	-.02	.44***				
5. Fatty	.03	.43***	.23*	.43***	.20*			
6. Savoury	-.23*	-.15	.45***	.13	.24*	.01		
7. Bitter	.10	.14	.06	.78***	.53***	.39***	.10	
8. Metallic	.15	.39***	.07	.52***	.28**	.48***	.01	.56***

Note. * $p < .05$, ** $p < .01$, *** $p < .00$

Eating Behaviours – Psychological Factors

The grounded theory models developed in Studies 1 and 2 identified multi factorial eating behaviours that were not disordered in nature, but that were associated with a range of

negative eating-related choices post-operatively in bariatric surgery patients. In the initial, exploratory bivariate correlations with total weight loss (TWL) at 6 months post-LSG, lack of control, relief from negative states, thoughts, and emotional eating reached statistical significance. Further, the correlation between emotional eating and ≤ 40 % EWL reached statistical significance. Results of these correlations are presented in Table 6.7 and 6.8. Further analysis of these psychological eating-related factors are examined in Chapter 8, which presents these findings as Study 3b.

Table 6.7:

Initial Correlations Table of TWL and Psychological Eating Behaviour Constructs

		TWL	1	2	3	4	5	6	7	8	9
Food Cravings Questionnaire											
1	Intentions	-.16									
2	Lack of Control	-.21*	.82***								
3	Positive Reinforcement	-.18	.77***	.68***							
4	Relief from negative states	-.22*	.70***	.56***	.83***						
5	Thoughts	-.20*	.76***	.80***	.70***	.60***					
6	Guilt	-.13	.71***	.72***	.49***	.50***	.65***				
7	Emotions	-.19	.80**	.78***	.79***	.76***	.75***	.69***			
8	Cues	-.11	.77***	.82***	.67***	.56***	.74***	.60***	.71***		
9	Hunger	-.14	.78***	.77***	.74***	.61***	.79***	.59***	.77***	.72***	
Emotional Eating Scale		-.12*	.63***	.63***	.68***	.65***	.59***	.53***	.77***	.54***	.58***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 6.8:

Initial Correlations Table of ≤ 40 % EWL and Psychological Eating Behaviour Constructs

		less than 40% EWL	1	2	3	4	5	6	7	8
Food Cravings Questionnaire-T										
1.	Intentions	.04								
2.	Lack of Control	.19	.82***							
3.	Positive Reinforcement	.13	.77***	.68***						
4.	Negative Reinforcement (Relief from negative states)	.10	.70***	.56***	.83***					
5.	Thoughts	.11	.76***	.80***	.70***	.60***				
6.	Guilt	.10	.71***	.72***	.49***	.50***	.65***			
7.	Emotions	.23*	.80***	.78***	.79***	.76***	.75***	.69***		
8.	Cues	.10	.77***	.82***	.67***	.56***	.74***	.60***	.71***	
9.	Hunger	.07	.78***	.77***	.74***	.61***	.79***	.59***	.77***	.72***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

6.4 REVISED WORKING MODEL

Figure 6.3 provides a summary of the revisions to the working model based upon the preliminary findings from initial correlations between EWL and measures identified in Section 6.2.3 and summarised in Table 6.1. This revised model forms the basis of findings reported in Chapters 7 and 8.

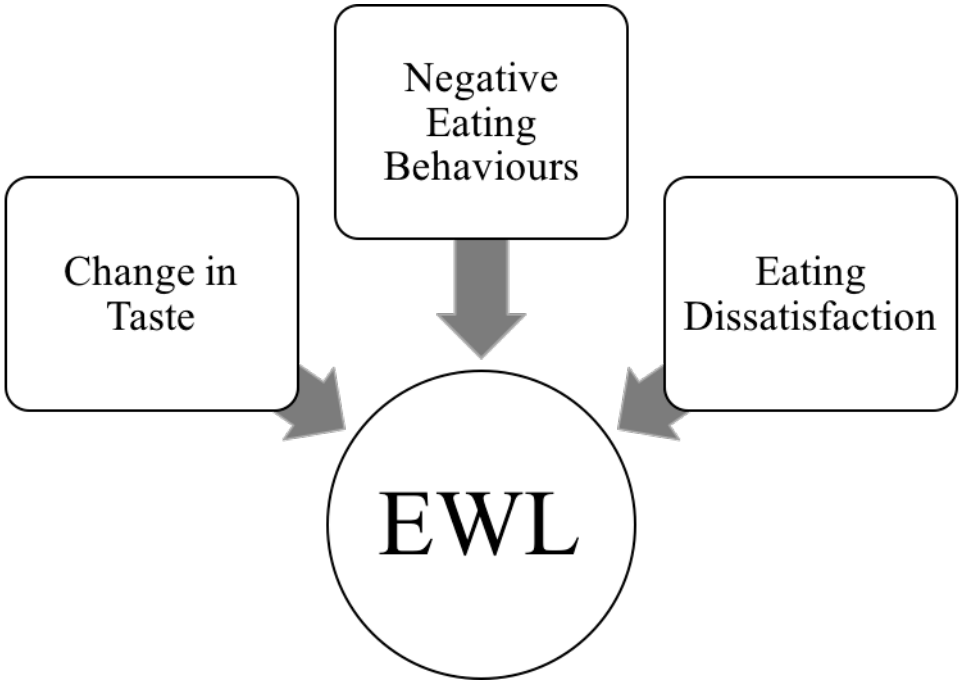

Figure 6.3. Summary of Revised Working Model

6.5 SUMMARY

This chapter has introduced Phase 2 of this program of research and the quantitative Study 3. This chapter provides a rationale the factors that were included in Phase 2, based upon the grounded theory models developed from Phase 1 of the program of research and identified in the relevant literature. This process led to the development of a working model. This section concluded by identifying the statistically significant constructs among the range of potential influencing factors in relation to expected weight loss outcome at 6 months post-primary LSG which were used to revise the working model. The following chapters, Chapters 7 and 8, examine the physiological patient-reported factors related to taste changes and satisfaction with eating behaviours and the psychological eating-related factors, respectively

Chapter 7: Study 3a

The purpose of this manuscript in the thesis was to ascertain the psychosocial factors that predicted patients' early weight loss trajectories in a Laparoscopic sleeve gastrectomy (LSG). The prior qualitative studies identified the psychosocial risk factors of changes in perception of taste, desire, and enjoyment of food as contributing to not achieving a successful outcome post-revisional and multiple revisional weight loss surgery. Although 132 participants initially took part in the study, 114 participants completed the survey at both times. Eight participants were excluded as they had primary LAGB or RYGB. These participants were excluded to ensure all participants underwent the same bariatric procedure; given the differences in the mechanisms of the bariatric procedures and the differences in the rate of weight loss. Thus, the psychological and physiological factors related to eating behaviours and impacting EWL were examined in a homogeneous sample. The participant demographics are reflective on the LSG procedure now being the most popular procedure being performed worldwide and in Australia (Australian Government, Medicare Data).

Few studies have examined taste as a factor impacting on eating behaviour post-LSG bariatric surgery. Taste is an important factor governing eating behaviour as it contributes to food preference and it is thought that it can modulate appetite and caloric intake (Berthoud & Zheng, 2012). Taste-related food reward from eating behaviours has been separated into the psychological and neural components; liking (enjoyment), wanting (desire) and learning (Berthoud & Zheng, 2012). Patients suffering with obesity report higher hedonic hunger and higher enjoyment for sweetness and fatty tastes compared with normal weight subjects (Bartoshuk et al., 2006). A recent study reported that there is a change in taste perception post-RYGB as patients reported an increased preference for lower fat and less sweet tasting foods and reported finding the eating experience less enjoyable (Behary & Miras, 2015). These changes in RYGB in food preferences were strongly attributed to changes in the perception of taste and the hedonic enjoyment of eating (Behary & Miras, 2015). A short term pilot study (N = 15) assessed food preference changes before and 6 weeks after vertical sleeve gastrectomy (VSG) and concluded that VSG

reduced the preference for calorie dense foods that were high in sugar and high in sugar and complex carbohydrates. Further, that the changes in food preferences may contribute to weight loss with VSG in the longer-term (Ammon et al., 2015). Furthermore, as previously stated, taste has been identified in previous studies as important factor governing eating behaviour as it contributes to food preference and it is thought that it can modulate appetite and caloric intake (Berthoud & Zheng, 2012). This finding indicates that it may be important to explore the role of taste changes in food preference post-bariatric surgery and the consequent impact on weight loss outcome. While there is a growing research literature on psychosocial and psychological factors that predict weight loss outcomes, a paucity of research has explored patient-reported outcomes that may contribute to the weight loss trajectory outcome. The prior qualitative studies identified that satisfaction of eating and changes in tastes were factors that contributed to participants' unsatisfactory psychosocial outcome. Therefore, this longitudinal study investigated the physiological patient-reported factors; satisfaction with eating behaviour and the change in taste perception, as well as desire, and enjoyment of flavours changes post-LSG which may impact on palatability and food preferences and, thus, impact the weight loss trajectory.

This manuscript has been submitted to *Obesity Surgery*

Publication title: Change in taste, enjoyment, desire and eating after laparoscopic sleeve gastrectomy- short term results

Authors: Michele Janse Van Vuuren, Esben Strodl, Katherine White, and Philip Lockie

Publication date of publication:

Statement of Contribution of Co-Authors for Thesis by Published Paper

The authors listed below have certified that:

1. they meet the criteria for authorship in that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
2. they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
3. there are no other authors of the publication according to these criteria;
4. potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit, and
5. they agree to the use of the publication in the student's thesis and its publication on the QUT ePrints database consistent with any limitations set by publisher requirements.

Contributor	Statement of contribution
Michele Janse Van Vuuren	Conceptualised the study, collected data, analysed data and prepared the manuscript for publication.
Esben Strodl	Assisted with study conceptualisation, analysis of data, and assisted with preparation of manuscript for publication.
Katherine White	Assisted with study conceptualisation, analysis of data, and assisted with preparation of manuscript for publication.
Philip Lockie	Assisted with study conceptualisation, analysis of data, and assisted with preparation of manuscript for publication

Principal Supervisor Confirmation

I have sighted email or other correspondence from all Co-authors confirming their certifying authorship.

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Date: 05 /07/2016

Submission to Obesity Surgery

Title: Change in taste, enjoyment, desire and eating after laparoscopic sleeve gastrectomy- short term results

Manuscript type: Clinical Research

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Acknowledgements: We thank the participants for partaking in this study and the bariatric surgeons for allowing access to their patients for this research study.

7.1 ABSTRACT

Background: Laparoscopic sleeve gastrectomy (LSG) incidence continues to increase worldwide because of its efficacy and low surgical risks. This study aimed to investigate satisfaction with eating and the change in taste perception, desire and enjoyment of flavour changes post-LSG and association with expected weight loss outcome at six months post-LSG.

Methods: 106 participants completing an online questionnaire 4 to 6 weeks as well as 6 to 8 weeks post-LSG bariatric surgery. The questionnaire included study specific questions about changes in taste, desire and enjoyment of 8 major categories of flavour, as well as Suters' Quality of Alimentation Questionnaire to measure satisfaction with eating.

Results: The majority of participants reported a post-surgery increase in the intensity of the flavour of sweet (60%, 55%) and fatty (57%, 70%) at both time points, respectively. Participants reported an increased acuity of spicy flavours and fatty tastes over time. Participants reported a decreased enjoyment for fatty (77%, 83%) and sweet (77%, 61%) flavours and decreased desire for fatty (83%, 84%) and sweet (82%, 68%) flavours over time. This study found an increase in taste acuity in all eight taste modalities and a decrease in desire and enjoyment of all taste modalities except salty and savoury flavours. The desire for sweet, bitter and metallic tastes changed over time. The participants reported: average (40%, 37%), good (33%, 42%), and excellent (15%, 11%) satisfaction with eating at both time points.

Conclusion: This preliminary study indicates that subjective changes in taste, desire and enjoyment of flavours of eight taste modalities are very common after LSG.

Keywords Sleeve Gastrectomy, taste changes, satisfaction with eating, flavour, desire, enjoyment

7.2 INTRODUCTION

Laparoscopic sleeve gastrectomy (LSG) is a restrictive single-stage procedure and is relatively new in the field of bariatric surgery but has already proven its efficacy in weight loss with low surgical risks (Zhang et al., 2015). Success is generally defined as an initial loss > 50% of excess weight loss (EWL) over 12-24 months (Gumbs et al., 2007). Many authors have reported that LSG produces an excess weight loss of 50% and 63% on average by 6 and 12 months postoperatively and the majority of the weight loss after LSG takes place during the first 6 months post surgery (Diamantis et al., 2013; Helmiö et al., 2014). Success in maintaining weight loss after bariatric surgery requires the ability to implement long-term changes in eating habits (Diamantis et al., 2013). However, patient-reported outcome measures in the LSG patient cohort, such as taste changes and satisfaction with eating that may impact on food preferences and, thus, long term weight loss, have received little attention in the literature. Studies in Roux-en-Y gastric bypass (RYGB) have indicated that patient reported outcomes such as subjective changes in appetite, taste and smell are very common after RYGB (Graham, Murty, & Bowrey, 2014). Moreover, in a study of 110 patients RYGB, majority of the patients believed taste is important to the enjoyment of food and RYGB patients (82%) reported a change in the taste of food or beverages after surgery (Tichansky et al., 2006). Further, most patients (83% of RYGB) agreed the loss of taste resulted in better weight loss outcome and those who experienced food aversions had more postoperative weight loss compared to their counterparts without such dislikes (Tichansky et al., 2006).

Taste is an important factor governing eating behavior as it contributes to food preference and it is thought that it can modulate appetite and caloric intake (Berthoud & Zheng, 2012). Taste-related food reward has been separated into the psychological and neural components of liking (enjoyment), wanting (desire) and learning (Berthoud & Zheng, 2012). Patients struggling with obesity report higher hedonic hunger and higher enjoyment for sweetness and fatty tastes compared with normal weight subjects (Bartoshuk et al., 2006). In contrast, very little is known of any relations between the perception of savoury tastes and obesity and eating behaviour (Donaldson, Bennett & Melichar, 2008). However, patients post-RYGB have a

preference for low fat and low sweet foods and report finding specific types of food less enjoyable. These changes in RYGB in food preferences and taste perception have been strongly attributed to changes in taste and hedonic enjoyment (Behary & Miras, 2015). In a recent qualitative study, the participants' reported an inability to experience satisfaction with eating behaviours post revisional bariatric surgery due to taste changes which, in turn, increased their negative affect and perpetuated the maladaptive eating cycle (Janse Van Vuuren, Strodl, White, & Lockie, 2016). A pilot study (n=15) assessed food preference changes before and 6 weeks after vertical sleeve gastrectomy (VSG) and concluded VSG reduced preference for calorie dense foods high in sugar, sugar and complex carbohydrate and that the changes may contribute to weight loss with VSG (Ammon et al., 2015). Limited published data however exists on food preferences, hedonic enjoyment and taste changes in LSG patients.

The aim of this study was therefore to investigate the patient-reported outcomes of changes in taste, enjoyment and desire of foods following LSG (at 4 to 6 weeks, and at 6 to 8 months) and to examine the impact of these changes on the early weight loss trajectory over a 6 to 8 month post-LSG follow-up period. It is hypothesized that the perception of taste, desire and enjoyment of flavours will change and may be associated with the extent of % EWL at 6 months post LSG. Further, it is expected that the changes over a 6 to 8 month period to the taste, desire and enjoyment of flavours are associated with extent of % EWL. A secondary aim was to examine quality of alimentation, in particular satisfaction with eating, as it is hypothesized that the perception of taste and desire of flavours at 6 to 8 months post-surgery are related to quality of alimentation.

7.2.1 Methods

The dieticians, nurses or surgeons at four bariatric clinics gave information leaflets to patients during 2014, if they were older than 18 years and were considering a primary bariatric procedure. Participants who were interested in the study contacted the researcher, had the study explained to them, and were then emailed the URL for the online questionnaires to complete it in their own time. The same participants were contacted 6 months later to complete the second set of questionnaires. Participants were mailed a AU $20 movie voucher after the completion of both questionnaires as a token of appreciation for their participation.

7.2.2 Measures

Self-reported details, including age, sex, height, pre-operative weight, type of surgery, occupation, marital status and level of education were obtained. Participants consented to self-report their weight in kilograms (kg) at 6 months post- surgery. Body Mass Index (BMI) was calculated for all participants and percentage excess weight loss (%EWL) was calculated at 6 months post LSG surgery. %EWL was calculated as preoperative weight, minus ideal body weight lost (ideal weight is that at a BMI of 25kgm^2), divided by excess body weight. See Table 1. Further, data were collected regarding patient satisfaction on the quality of alimentation and changes in taste, desire and enjoyment of food.

Taste Desire and Enjoyment Change Questionnaire (TDECQ)

The TDECQ questionnaire is a study-specific questionnaire consisting of 24 questions with a Likert scale that ranges from 1 to 5 (Figure 1). The TDECQ provides an indication of the degree of extent the tastes, desires and enjoyment for certain foods or liquids have changed or stayed the same since undergoing bariatric surgery. Prior to the start of study, the TDECQ questionnaire was reviewed by educational and health professionals for content and readability. The revised questionnaire was pilot tested with a sample of 10 bariatric patients to test for content validity to ensure the developed questionnaire assessed the specific constructs of interest.

Taste Desire and Enjoyment Change Questionnaire (TDECQ)

The questions below relate to the extent your tastes and desires for certain foods or liquids have changed or stayed the same since undergoing bariatric surgery. Please circle the number that best represents the extent of any changes in taste and the extent of change of desires/cravings for certain foods or liquids.
*(foods refers to all types of foods and liquids)
The rating scale is as follows:

1- Much weaker flavour/taste;
2- Weaker flavour/taste
3- No change in strength of flavour/taste
4- Stronger flavour /taste
5- Much stronger flavour/taste

1.	I noticed that the taste of salty foods has changed	1	2	3	4	5
2.	I noticed that the of taste of sugar /sweet foods has changed	1	2	3	4	5
3.	I noticed that the taste of fatty/oily foods has changed	1	2	3	4	5
4.	I noticed that the taste of sour/tart foods has changed	1	2	3	4	5
5.	I noticed that the taste of savoury foods has changed	1	2	3	4	5
6.	I noticed that the taste of spicy or piquant foods has changed	1	2	3	4	5
7.	I noticed that the taste of bitter foods has changed	1	2	3	4	5
8.	I noticed that foods and liquids have a metallic taste	1	2	3	4	5

The rating scale is as follows:

1- Much weaker desire/enjoyment
2- Weaker desire/enjoyment
3- No change in desire/enjoyment
4- Stronger desire/enjoyment
5- Much stronger desire/enjoyment

9.	I noticed that the desire for salty foods has changed	1	2	3	4	5
10.	I noticed that the desire for sugar/sweet foods has changed	1	2	3	4	5
11.	I noticed that the desire for fatty/oily foods has changed	1	2	3	4	5
12.	I noticed that the desire for sour/tart foods has changed	1	2	3	4	5
13.	I noticed that the desire for spicy/piquant foods has changed	1	2	3	4	5
14.	I noticed that the desire for bitter foods has changed	1	2	3	4	5
15.	I noticed that the desire for metallic tasting foods has changed	1	2	3	4	5
16.	I noticed that the desire for savoury foods has changed	1	2	3	4	5
17.	I noticed that the enjoyment of salty foods has changed	1	2	3	4	5
18.	I noticed that the enjoyment of sweet foods has changed	1	2	3	4	5
19.	I noticed that the enjoyment of fatty /oily foods has changed	1	2	3	4	5
20.	I noticed that the enjoyment of sour/tart foods has changed	1	2	3	4	5
21.	I noticed that the enjoyment of spicy/piquant foods has changed	1	2	3	4	5
22.	I noticed that the enjoyment of bitter foods has changed	1	2	3	4	5
23.	I noticed that the enjoyment of savoury foods has changed	1	2	3	4	5

Figure 7.1. Taste Desire and Enjoyment Change Questionnaire (TDECQ)

Quality of Alimentation questionnaire

Suters' Quality of Alimentation questionnaire is a recognised tool for assessing food tolerance in bariatric patients to evaluate the overall patient satisfaction regarding the quality of alimentation (Suter et al., 2007). Section 1 assesses satisfaction with current ability to consume food, with a score range from 1 (*very poor*) up to 5 (*excellent).*

Data Analysis

In 2014, 132 Participants (113 female) from four sites, completed questionnaires at 4 to 6 weeks post bariatric surgery and with 114 of these participants completing the same measures again at 6 to 8 months *(N* = 114) indicating a follow up response rate of 88.4%. Participants completing both sets of measures predominantly underwent LSG (*N* = 106), three participants underwent Laparoscopic adjustable band (LAGB) and five underwent Roux-en-Y gastric bypass (RYGB). Results of the 106 (92 female) LSG participants who completed questionnaires at both times are reported.

Table 7.1: Participant Characteristics

Characteristic	**Value**
Patients (n)	106
Mean age (yr.)	42 (*SD* 10.72)
Female (%)	81
Mean BMI (kg/m^2)	44 (*SD* 7.35)
Mean %EWL at 6 months	64 (*SD* 21)
Mean %TWL at 6 months	26 (*SD* 5.88)
Working Status (%)	80
Employed	20
Not working	
Level of Education (%)	30
High School	27
Post-High school	42
University	
Marital Status (%)	
Married	42
Defacto / In a relationship	27
Single	19
Divorced	4
Widowed	3

BMI = body mass index; % EWL = percentage of excess weight loss; %TWL= percentage of total weight loss. Data presented as mean with standard deviation, unless noted otherwise.

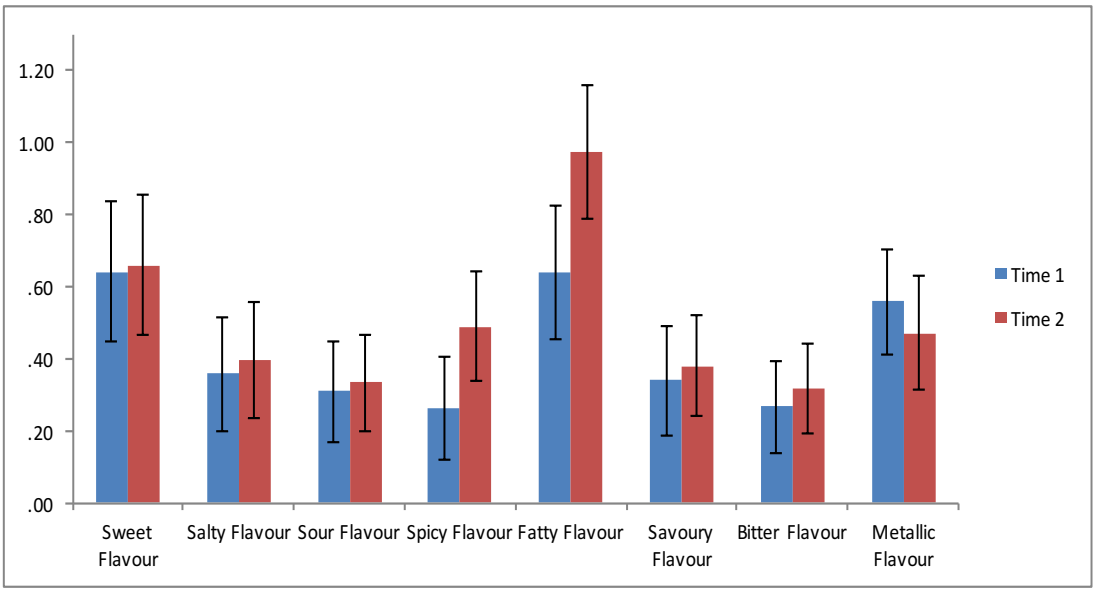
Analysis was performed using SPSS 23 software. Missing data were excluded. A response of zero in the taste perception items indicated no change in taste perception and, therefore, a series of one-sample t-tests were used to test if the responses were significantly different from zero. A two-tailed, paired sample *t*-test with an alpha level of .05 was used to compare the change in flavour at both times. A series of bivariate correlations were completed with extent of % EWL and changes in the perception of taste, desire and enjoyment of flavours at Time 1; satisfaction score and changes in the perception of taste and desire of flavours at Time 2 and % EWL and change in flavour, desire and enjoyment over time (T2 – T1).

7.3 RESULTS

The results at the two time points were varied, with an average of 52 % (*SD* =13.71) and 47% (*SD* = 16.07) participants respectively reporting unchanged tastes, 40% (*SD* = 12.55) and 44% of participants (*SD* = 12.98) respectively reporting increased intensity of taste of flavours, and 7.35% (*SD* 2.78) and 10% (*SD* = 8.99) respectively reporting reduced intensity of taste of flavours across the eight taste modalities. More specifically, the majority of participants reported an increase in the intensity of the flavour of sweet (60%, 55%) and fatty (57%, 70%) tastes, at 4-6 weeks (Time 1) and 6-8 months (Time 2) respectively.

7.3.1 Intensity of Flavour Change

Figure 7. 2 shows the means and 95% confidence intervals of changes in the intensity of flavour in eight taste perception modalities at both 4 to 6 weeks (Time 1) and again at 6 to 8 months (Time 2) post LSG surgery. These results indicated statistically significant increases in the intensity of perception of all flavours at both time points, with greatest increases shown in sweet, fatty and metallic flavours at Time 1 and fatty, spicy and sweet flavours at Time 2. A series of paired sample *t*-tests were used to examine the difference of change in intensity of flavour between both time points. The change in intensity of flavour was significantly different for fatty flavour, t (105) = -2.57, p = .012, and spicy flavour, t (105) = -3.09, p = .003, between both time points and the change in intensity of fatty and spicy flavour was stronger at Time 2 than at Time 1. There was no significant difference in change in the intensity of the other six flavours across time.

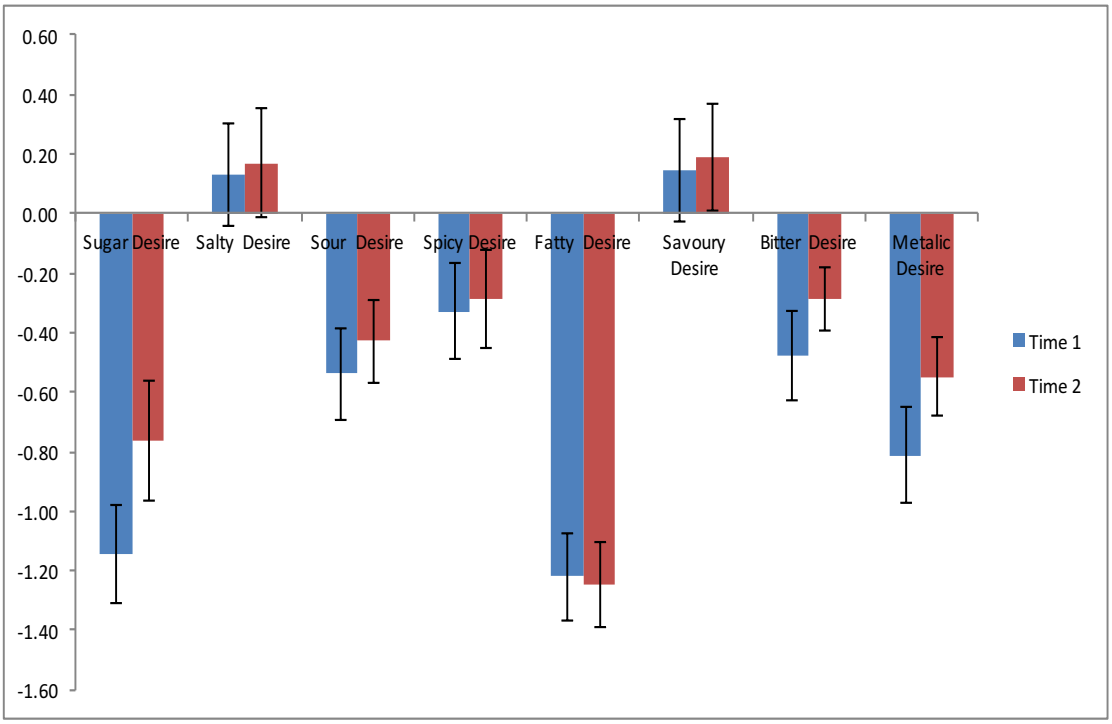


*Note: Time1=4-6 weeks, Time 2= 6-8 months post LSG. The t-values for time 1 measures were: Sweet flavour, t (105) = 6.56***, Salty flavour, t(105) = 4.51***, Sour flavour, t(105) = 4.44***, Spicy flavour, t(105) = 3.70***, Fatty flavour, t(105) = 6.89***, Savoury flavour, t(105) = 4.49***, bitter flavour, t(104) = 4.09***, and Metallic flavour, t(103) = 7.47***. The t-values for time 2 measures were: Sweet flavour, t (105) = 6.71***, Salty flavour, t(105) = 4.95***, Sour flavour, t(104) = 4.86***, Spicy flavour, t(105) = 6.45***, Fatty flavour, t(105) = 10.41***, Savoury flavour, t(104) = 5.48***, bitter flavour, t(103) = 5.04***, and Metallic flavour, t(105) = 5.93***. *p < .05; **p< .01; ***p<.001.*

Figure 7.2. Means and 95% confidence intervals of changes in intensity in flavour in eight taste perception modalities at Time 1 and Time 2

7.3.2 Intensity of Desire change

Figure 7.3 shows the means and 95% confidence intervals of changes in intensity of desire in eight taste perception modalities at both time points. These results indicated significant change in intensity of desire in all taste modalities at both time points ($p < .001$), except for change in salty desire, at Time 1, t (105) = 1.52, p = .132 and Time 2, t (105) = 1.86, p = .066, change in savoury desire at Time 1, t (104) = 1.60, p = .104 and Time 2, t (103) = 2.12, p = .036, with greatest decreases seen in sweet and fatty flavour desire. A series of paired sample t-tests examined the difference in change in desire between both time points. The change in intensity in desire between both time points was significantly different for sweet flavour, t (105) = -3.65, $p < .001$, bitter flavour, t (98) = -2.76, p = .007, and metallic flavour, t (105) = -2.86, p = .005 with these flavours showing the greatest increase in intensity in desire back to pre-surgery levels.

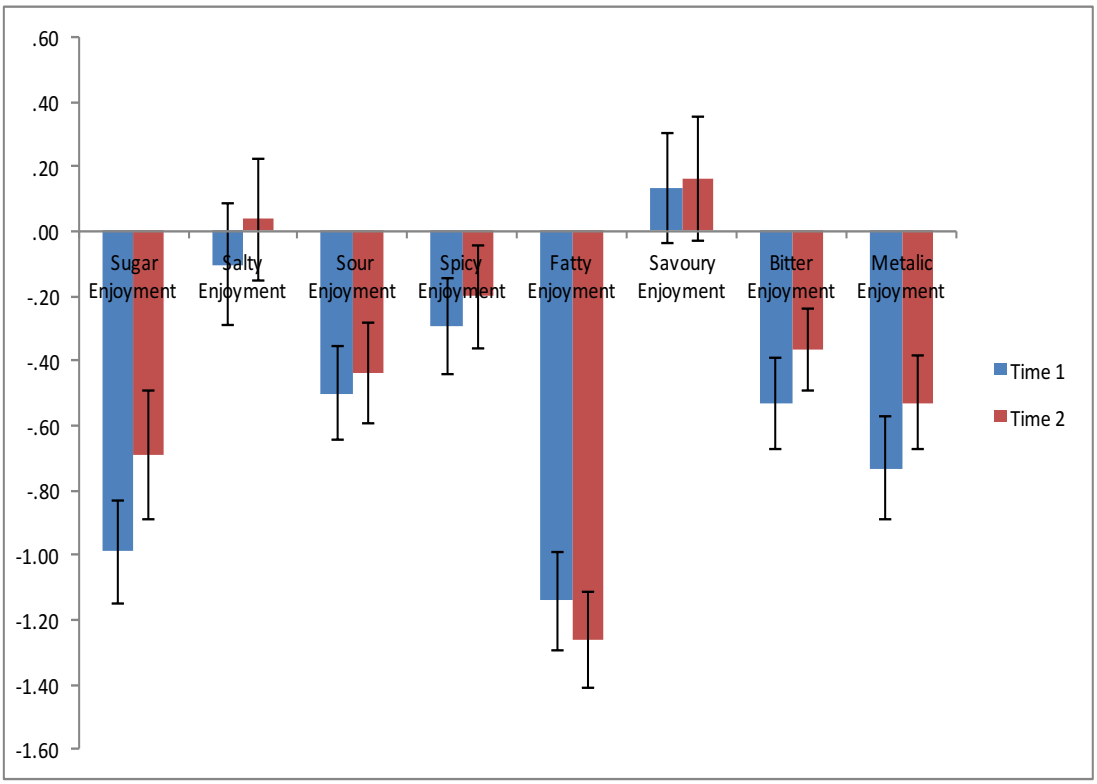


*Note: Time1=4-6 weeks, Time 2= 6-8 months post LSG. The t-values for time 1 measures were: Sweet desire, t(105) = 13.74***, Salty desire, t(105) = 1.52, Sour desire, t(103) = 6.98***, Spicy desire, t(105) = 4.07***, Fatty desire, t(104) = 16.45***, Savoury desire, t(104) = 1.64, bitter desire, t(100) = 6.32***, and Metallic desire, t(105) = 10.07***. The t-values for time 2 measures were: Sweet desire, t(105) = 7.45***, Salty desire, t(105) = 1.86, Sour desire, t(104) = 6.00***, Spicy desire, t(104) = 3.44***, Fatty desire, t(105) = 17.01***, Savoury desire, t(103) = 2.12*, bitter desire, t(103) = 5.33***, and Metallic desire, t(105) = 8.14***. *p < .05; **p< .01; ***p<.001.*

Figure 7.3. Means and 95% confidence intervals of changes in intensity of desire of flavour in eight taste perception modalities at Time 1 and Time 2

7.3.3 Intensity of Enjoyment change

Figure 7. 4 shows the means and 95% confidence intervals of changes in intensity of enjoyment in eight taste perception modalities at both time points. These results indicated statistically significant decreases in intensity in enjoyment in sweet, sour, spicy, fatty bitter and metallic tastes at both time points, but no change in salty and savoury enjoyment. A series of paired sample *t* tests was used to examined differences in change in intensity of enjoyment between both times points. The change in intensity in enjoyment was significantly different for sweet, t (105) = -3.25, p = .002, bitter, t (104) = -2.34, p = .021 and metallic taste, t (103) = -2.31, p = .023. These results indicated decreases in the intensity in enjoyment of sweet, bitter and metallic tastes over time.

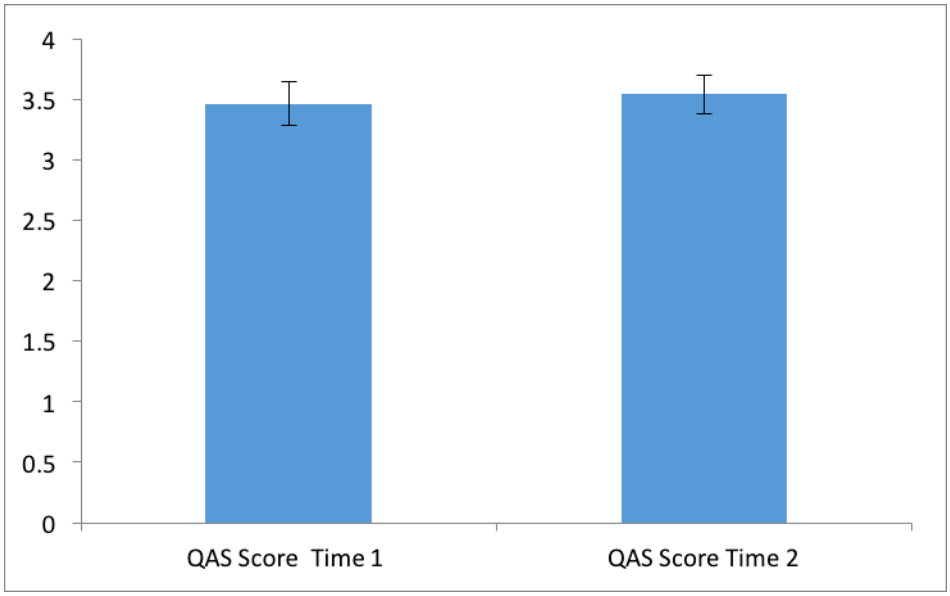


*Note: Time1=4-6 weeks, Time 2= 6-8 months post LSG. The t-values for time 1 measures were: Sweet enjoyment, t(105) = 12.40***, Salty enjoyment, t(105) = 1.10, Sour enjoyment, t(105) = 6.89***, Spicy enjoyment, t(105) = 3.92***, Fatty enjoyment, t(105) = 14.95***, Savoury enjoyment, t(105) = 1.54, bitter enjoyment, t(104) = 7.44***, and Metallic enjoyment, t(103) = 9.14***. The t-values for time 2 measures were: Sweet enjoyment, t(105) = 6.91***, Salty enjoyment, t(105) = 0.39, Sour enjoyment, t(104) = 5.48***,Spicy enjoyment, t(104) = 2.48*, Fatty enjoyment, t(105) = 16.86***, Savoury enjoyment, t(104) = 1.69,bitter enjoyment, t(105) = 5.81***, and Metallic enjoyment, t(105) = 7.17***.*
**p < .05; **p< .01; ***p<.001.*

Figure 7.4. Means and 95% confidence intervals of changes in intensity of enjoyment of flavour in eight taste perception modalities at Time 1 and Time 2

Quality of Alimentation Questionnaire

Participants reported mean scores of 3.46 ±. 82 at Time 1 and 3.54 ± .95 at Time 2, in section 1, indicating that they were satisfied with their eating behavior and there was no statistically significant change over time. Results are detailed in Figure 5.



Note: Time 1=4-6 weeks post LSG, Time 2= 6-8 months post LSG.

Figure 7.5. Means and 95% confidence intervals of satisfaction with eating at Time 1 and Time 2

7.3.4 Association with Extent of % Excess Weight Loss and Satisfaction with Quality of Alimentation

Time 1 Variables

There was a statistically significant but weak association of changes in savoury enjoyment at 4 to 6 weeks post-LSG and extent of % EWL at 6 months post-surgery, r (104) =-.229, $p < .05$. This result indicates that the greater the increase in enjoyment of savoury flavour, the greater the subsequent increase in extent of % EWL. (See Table 7.2,7.3,7.4).

Table 7.2: Correlations Table of % EWL and Flavour Change at Time 1(4 – 6 weeks post-surgery)

	%EWL	1	2	3	4	5	6	7
1. Sugar	.16							
2. Salty	.00	.45***						
3. Sour	.01	.47***	.57***					
4. Spicy	.08	.44***	.55***	.60***				
5. Fatty	-.03	.33**	.43***	.56***	.42***			
6. Savoury	-.01	.32**	.51***	.45***	.41***	.37***		
7. Bitter	.00	.44***	.49***	.66***	.71***	.48***	.53***	
8. Metallic	-.05	.29**	.42***	.31**	.33**	.25*	.41***	.35***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 7.3: Correlations Table of % EWL and Desire Change at Time 1(4 – 6 weeks post-surgery)

	%EWL	1	2	3	4	5	6	7
1. Sugar	-.05							
2. Salty	-.12	.00						
3. Sour	.06	.31**	.32**					
4. Spicy	-.03	.17	.26**	.56***				
5. Fatty	-.08	.55***	.03	.46***	.25*			
6. Savoury	-.12	-.01	1.00***	.31**	.26**	.03		
7. Bitter	.17	.24*	.24*	.68***	.49***	.37***	.24*	
8. Metallic	.13	.27**	.07	.35***	.19	.39***	.07	.49***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 7.4: Correlations Table of % EWL and Enjoyment Change at Time 1(4 – 6 weeks post-surgery)

	%EWL	1	2	3	4	5	6	7
1. Sugar	.10							
2. Salty	-.07	-.01						
3. Sour	.08	.27**	.16					
4. Spicy	.06	.17	-.02	.44***				
5. Fatty	.03	.43***	.23*	.43***	.20*			
6. Savoury	-.23*	-.15	.45***	.13	.24*	.01		
7. Bitter	.10	.14	.06	.78***	.53***	.39***	.10	
8. Metallic	.15	.39***	.07	.52***	.28**	.48***	.01	.56***

Note. * $p < .05$, ** $p < .01$, *** $p < .00$

Time 2 Variables

There were significant but weak associations between satisfaction with eating at 6 to 8 months and change of the intensity of the following flavours at 6 to 8 months post-surgery (i.e. perception of change from pre-surgery to 6-8 month follow-up): change in sweet flavour, r (106) =.268, $p < .05$, change in sour flavour, r (105) =.231, $p < .05$, change in savoury flavour, r (105) =.208, $p < .05$, change in bitter flavour r (104) =.237, $p < .05$ and change in metallic flavour, r (106) =.257, $p < .05$. (See Table 7.5)

There were significant but weak associations between satisfaction with eating at 6 to 8 months post-surgery and change in salty desire at 6-8 months post-surgery r (106) =-.231, $p < .05$ and change in savoury desire, r (104) =-.202, $p < .05$. This result indicates the greater the satisfaction with eating, the greater the subsequent increase in salty and savoury desire. (See Table 7.6)

Table 7.5: Correlations Table of Satisfaction Score and Change of Flavours in Eight Taste Modalities at 6-8 months

	Satisfaction	1	2	3	4	5	6	7
1. Sugar	.27**							
2. Salty	.08	.41***						
3. Sour	.23*	.32**	.60***					
4. Spicy	.03	.31**	.43***	.52***				
5. Fatty	-.10	.34***	.44***	.35***	.39***			
6. Savoury	.21*	.501***	.36***	.29**	.33**	.35***		
7. Bitter	.24*	.33**	.41***	.62***	.59***	.34***	.43***	
8. Metallic	.26**	.51***	.31**	.13	.26**	.28**	.53***	.27**

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 7.6: Correlations Table of Satisfaction Score and Change of Desire in Eight Taste Modalities at 6-8 months

	Satisfaction 1	2	3	4	5	6	7	
1. Sugar	-.08							
2. Salty	-.23*	.10						
3. Sour	-.14	.18	.40***					
4. Spicy	.00	.15	.39***	.56***				
5. Fatty	.02	.30**	.14	.36***	.34***			
6. Savoury	-.20*	.08	1.00***	.37***	.36***	.13		
7. Bitter	-.03	-.01	.36***	.70***	.51***	.14	.36***	
8. Metallic	-.08	.24*	.19	.36***	.24*	.36***	.15	.42***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Change from Time 1 to Time 2

There were statistically significant bivariate associations between change over time in perception of savoury enjoyment (Time 2 – Time 1) and extent of % EWL at 6 months post-surgery, but this association is also weak in terms of the strength of the association, r (105) =.248, $p < .05$. This result indicates that the greater the increase over time in perception of savoury enjoyment, the greater the subsequent increase in extent of % EWL. (See Table 7.7,7.8,7.9)

Table 7.7: Correlations Table of % EWL and Change in Flavour Change (T2 – T1)

	%EWL	1	2	3	4	5	6	7	
1. Sugar	-.11								
2. Salty	-.04	.27**							
3. Sour	-.04	.33**	.49***						
4. Spicy	-.10	.31**	.34**	.42**					
5. Fatty	.01	.45***	.35***	.36***	.30**				
6. Savoury	.08	.30***	.33***	.35***	.32**	.21*			
7. Bitter	-.02	.38***	.34***	.52***	.53**	.30**	.42***		
8. Metallic	.01	.33**	.08	.07	.15	.04	.41***	.19	

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 7.8: Correlations Table of % EWL and Change in Enjoyment Change (T2 – T1)

	%EWL	1	2	3	4	5	6	7	
1. Sugar	.01								
2. Salty	.06	.07							
3. Sour	.02	.15	.11						
4. Spicy	-.08	.26**	-.03	.17					
5. Fatty	.07	.19	.02	.09	.11				
6. Savoury	.25*	.11	.32**	-.06	.31**	-.09			
7. Bitter	-.02	-.001	-.09	.49***	.12	.02	-.04		
8. Metallic	-.12	.05	-.07	.18	-.06	.13	-.08	.31**	

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 7.9: Correlations Table of % EWL and Change in Desire change (T2 – T1)

	%EWL	1	2	3	4	5	6	7
1. Sugar	.04							
2. Salty	.04	.09						
3. Sour	-.06	.17	.12					
4. Spicy	-.04	.11	.18	.44***				
5. Fatty	.06	.32**	.05	.32**	.26**			
6. Savoury	.03	.09	1.00***	.13	.20*	.07		
7. Bitter	-.18	.11	.09	.48***	.19	.08	.09	
8. Metallic	-.04	.07	.05	.14	.06	.10	.05	.46***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

DISCUSSION

This preliminary study investigated the patient reported outcomes of satisfaction with eating and changes in taste, enjoyment and desire of foods at 4 to 6 weeks and 6 to 8 months' post LSG. It was predicted that LSG patients' perception of taste, desire and enjoyment of foods would change post LSG. This hypothesis was confirmed.

The majority of participants reported an increase in the intensity of the flavour of sweet (60%, 55%) and fatty (57%, 70%), at both time points compared with their recollection of the intensity of these flavours prior to surgery. Thus, these results show an increase in intensity of flavour of high calorie dense sweet foods and fatty foods initially for majority of participants post LSG. This finding is consistent with studies showing food preferences in rodents after sleeve gastrectomy increased for low-fat and less calorically dense foods (Wilson-Perez et al., 2012). This study also demonstrated, a decreased enjoyment for fatty (77%, 83%) and sweet (77%, 61%) flavours and decreased desire for fatty (83%, 84%) and sweet (82%, 68%) flavours at both time points following LSG. These findings are similar to those reported by Himpens et al. (Himpens, Dapri, & Cadière, 2006) who found a loss of craving for sweet flavours post LSG procedure as well as a decrease in desire for both sweet and fatty flavours post LSG. Miras and Le Roux (2010) offer an explanation for this

occurrence in other bariatric surgery patients such as RYGBP patients, by reporting an increase in the sweet taste acuity which, in turn, leads to a decreased desire to consume such foods. The results of this study supports this notion as there was an increase in taste acuity in all eight taste modalities and a decrease in the desire and enjoyment of all taste modalities except change in salty and savoury flavours and change in savoury enjoyment. Additionally, the desire and enjoyment for sweet, bitter and metallic tastes increased over time. Participants reported an increased intensity of spicy flavours and fatty tastes over time. The changes in taste sensitivity and the decreased desire and enjoyment of specific foods may translate into long term changes in food preferences.

We also predicted that changes in LSG patients' perception of taste, desire and enjoyment of foods post-surgery would be associated with extent of % EWL over a 6-month period. This hypothesis was partially confirmed. Specifically, we found that only changes to the perception of savoury enjoyment at 4 to 6 weeks' post-surgery, and further changes from 4 to 6 weeks to 6 to 8 months were weakly associated with extent of % EWL at 6 months post- surgery. It is suggested that this increase in savoury taste enjoyment may be associated with the consumption of protein rich foods and therefore greater satiation. Prior studies have found that protein is more satiating than either carbohydrate (Bertenshaw,Yeomans, Martens,Lemmens & Westerterp-Plantenga, 2007) or fat (Weigle, 2005).

While weight loss is one measure of change and is an important parameter to consider, satisfaction with eating is an important patient reported outcome as it impacts on satisfaction with the surgery outcome. The majority of the participants in this study were satisfied with their quality of alimentation post LSG. Other studies have found similar results in LSG patients (Schweiger, Weiss, & Keidar, 2010; Sioka et al., 2013). However, in this study, satisfaction with eating was weakly associated with changes in taste, with a greater satisfaction of eating behaviors being associated with increased change of intensity from 4 to 6 weeks to 6 to 8 months of sweet, sour, savoury, bitter and metallic flavours. In contrast, participants who were satisfied with their eating behaviors at 6-8 months had a decreased desire for salty and savoury flavours from 4 to 6 weeks to 6 to 8 months. Thus, the findings confirmed the hypothesis that changes in the perception of taste and desire of flavours at 6 to 8 months post-surgery are related to quality of alimentation.

There are limitations to the current study: the short term follow-up, self reported BMI, perceived perception of flavour change over 4 to 6 weeks and 6 to 8 months, the relatively small sample size, use of a not yet validated flavour questionnaire (TDESQ) and all participants coming from the same ethic group. In this study, 18 participants were lost to follow up and their outcomes are unknown.

7.4 CONCLUSION

In conclusion, changes in taste perception, desire and enjoyment of flavours occurs for a majority of participants post-LSG which may have important implications on food preferences and satisfaction with eating behaviors post-surgery. In addition, the results indicated that increases in the perception of savoury enjoyment post-LSG are weakly associated with extent of % EWL. Furthermore, the perception of changes in taste and desire of flavours post-surgery are related to quality of alimentation. This preliminary study suggests that LSG patients should to be made cognisant of taste changes as part of the informed consent process for bariatric surgery. Additionally, taste changes post-LSG may be an opportunity for intervention in changing eating behaviour and food preferences.

7.5 ETHICAL CONSIDERATIONS

Ethics approval was obtained from the university's Human Research Ethics Committee.

7.6 CONFLICT OF INTEREST STATEMENT

No conflict of interest has been declared by the authors.

7.7 FUNDING

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

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Chapter 8: Study 3b

The purpose of this manuscript in the thesis was to ascertain the psychosocial factors that predicted patients' early weight loss trajectories in a Laparoscopic sleeve gastrectomy (LSG). Findings from grounded theory models developed in Studies 1 and 2 were applied to identify the psychosocial factors that predicted patients' early weight loss trajectories following primary bariatric procedures. A total of 106 participants' data were included in this study. The eating behaviour constructs identified in the qualitative studies were multifactorial and, thus, examining these constructs with the multidimensional questionnaire such as the FCQ–T was important as it investigated eating behaviours that were not disordered in nature, but that may be associated with a range of negative eating-related choices post-operatively in bariatric surgery patients. Thus, all the nine dimensions of the FCQ – T: intentions to consume food, anticipation of positive reinforcement, relief from negative states, lack of control over eating, preoccupation with food, hunger, emotions, cues that trigger cravings, and guilt were included. Consequently, this longitudinal study reported on the impact of psychological factors such as food cravings that influence eating behaviours in LSG patients with poorer weight loss outcomes at 6 months. However, as this is a preliminary study at 6 months post-LSG, ≤ 40 % EWL was utilised and was calculated using the following formula: (post-operative weight loss)/(pre-operative excess weight) x100. BMI ≥ 25kg/m^2 is recognised as the lowest limit of overweight and, therefore, excess weight was calculated relative to a BMI of 25kg/m^2 (Oria et al., 2005). Figura et al. (2015) classified LSG groups based on the % EWL at 6 months into three groups with (14-39%) EWL as low, moderate (40-59%), and high (60-115%). Similarly, the current study classified the LSG participants into two groups, ≤ 40 % EWL and ≥ 41% EWL and utilised the ≤ 40 % EWL to identify those participants achieving a lower weight loss trajectory than their cohort. The aim was to investigate negative eating-related choices in those participants on a lower weight loss trajectory who consequently may be at-risk for not achieving expected weight loss outcome in the longer-term.

This manuscript will be submitted to a peer reviewed Journal.

Publication title: Short term results of Sleeve Gastrectomy: Eating behaviours

Authors: Michele Janse Van Vuuren, Esben Strodl, Katherine White, and Philip Lockie

Publication date of publication: Published by

Statement of Contribution of Co-Authors for Thesis by Published Paper

The authors listed below have certified that:

1. they meet the criteria for authorship in that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
2. they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
3. there are no other authors of the publication according to these criteria;
4. potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit, and
5. they agree to the use of the publication in the student's thesis and its publication on the QUT ePrints database consistent with any limitations set by publisher requirements.

Contributor	Statement of contribution
Michele Janse Van Vuuren	Conceptualised the study, collected data, analysed data and prepared the manuscript for publication.
Esben Strodl	Assisted with study conceptualisation, analysis of data, and assisted with preparation of manuscript for publication.
Katherine White	Assisted with study conceptualisation, analysis of data, and assisted with preparation of manuscript for publication.
Philip Lockie	Assisted with study conceptualisation, analysis of data, and assisted with preparation of manuscript for publication

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Title: Short term results of Sleeve Gastrectomy: Eating behaviours

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Acknowledgements: We thank the participants for partaking in this study and the bariatric surgeons for allowing access to their patients for this research study.

Title: Short term results of Sleeve Gastrectomy Patients

Manuscript type: Integrated Health Article

Running title: Short term results of Sleeve Gastrectomy

8.1 ABSTRACT

Abstract

Background: Laparoscopic Sleeve Gastrectomy (LSG) incidence has increased worldwide. However, a minority of patients achieve inadequate weight loss and some experience weight regain. Little is known of the influence of eating behaviours, such as eating in response to cravings, on the early weight loss trajectory. This study aimed to identify the eating behaviours of those patients at-risk of not achieving expected weight loss outcome (EWL) at 6 months post-LSG.

Setting: Private Practice

Methods: 106 (80.7% female) participants who underwent LSG from four sites completed the questionnaires at 4-6 weeks post-bariatric surgery and reported their weight at 6 months post surgery. Achieving less than 40% EWL was included as the outcome variable and the first set of analyses examined the nine subscales of the food cravings questionnaire-trait version (FCQ-T) as potential predictors of that change. Logistic regression was used to examine the relationship between weight loss and the nine variables which are indicators of; intensions to eat, positive reinforcement, negative reinforcement, lack of control, preoccupation with food, feelings of hunger, negative affect, emotional eating, and guilty feelings.

Results: Participants lost an average 64 % EWL *(SD* = 21% EWL) 6 months after LSG surgery. Results indicated the overall model was significant and, of the nine variables, the emotional eating subscale (adjusted OR = 4.19, p = .018) predicted a failure to achieve EWL.

Conclusion: Emotional eating experienced four to six weeks following LSG may predict poor weight loss outcomes at 6 months.

Keywords: Sleeve gastrectomy, early weight loss outcomes, emotional eating, food cravings

8.2 INTRODUCTION

Obesity is a global health concern and increasing numbers of patients are undergoing bariatric surgery as it is currently the most effective weight loss intervention for patients with severe obesity and significantly reduces morbidity and mortality (Sjöström et al., 2007). Laparoscopic sleeve gastrectomy (LSG) is a promising bariatric procedure and provides effective weight loss and resolution of co- morbidities for 3-5 years (Farrell et al., 2009). LSG is now the most popular method of weight-loss surgery in America, surpassing Roux-en-Y gastric Bypass (RYGB), which had been the most common procedure for decades (Schauer et al., 2014). Most of the weight loss after LSG takes place during the first 6 months after surgery and the weight loss gradually slows down thereafter, continuing up to 2 years postoperatively and often followed by a slight regain in weight in the next few years (Helmiö et al., 2014). Although the majority of bariatric patients achieve a successful post-surgical weight loss outcome, defined as ≥ 50% excess weight loss (% EWL) for the first 1-2 years post-surgery, a minority (15-20%) may not achieve this outcome (Maggard et al., 2005) and it is estimated that 20% of patients will regain all of the weight lost (Benotti & Forse, 1996).

The variability in weight loss outcomes has been attributed to among other outcomes, maladaptive post-surgical eating behaviours (Larsen et al., 2006), which include binge eating (Kalarchian et al., 2002), binge eating disorder with a sense of loss of control and grazing (Colles et al., 2008b), and emotional eating (Fischer et al., 2007). Further, dysfunctional eating appears to be associated with weight regain in the longer-term (Meany, Conceição, & Mitchell, 2014). Fischer et al. (2007) found in their study of 144 RYGB patients that emotional eating is frequently found among patients suffering obesity and that emotional eating can hinder weight loss outcomes. Emotional eating is estimated to be present in 38% of weight-loss surgery patients. (Miller-Matero et al., 2014). However, other psychological factors have also been shown to be predictive of outcome in bariatric patients. For example, White, Kalarchian, Masheb, Marcus, and Grilo (2010) found postoperative loss of control (LOC) eating behaviours at 6 months in RYGB patients predicted a poorer weight loss outcome at later assessment times and LOC at 12 months predicted weight loss at 24 months post-surgery and weight regain. Thus, while there is some emerging

evidence of dysfunctional eating behaviours and LOC being predictors of outcome in bariatric surgery patients, other plausible psychological factors such as food cravings have not been extensively studied.

Food cravings are strong physiological or psychological desires that encourage the seeking and eating of a specific type of food (Cepeda-Benito et al., 2001). Thus, food cravings are different from homeostatic hunger in that they are conceptualized as strong desires for particular foods that are difficult to resist (Rabinovitz, 2005; Weingarten & Elston, 1990). Cravings are typically for high caloric foods and individuals crave different types of food (Chao et al., 2014). Food cravings that instigate eating behaviours are experienced by most people on occasion (Lafay et al., 2001). However, more frequent and more intense food cravings are associated with eating disorders such as binge eating disorder and with obesity (Abiles et al., 2010). Individuals with higher Body Mass Index (BMI) have higher frequencies of food cravings than normal weight (BMI < 25 kg/m^2) individuals (Abiles et al., 2010; Chao et al., 2014). Additionally, food cravings have gained attention for their potential role in linking addictive behaviours and eating disorders (Verheul et al., 1999). Episodes of overeating may be preceded by specific cravings for food and food-related cues (Jarosz et al., 2007). Additionally, food cravings have been associated with future food intake and difficulty resisting eating and with emotional eating (Jarosz et al., 2007). Experiencing food cravings had been identified in a prior qualitative study as contributing to unsatisfactory weight loss outcomes in patients requiring revisional surgeries for inadequate weight loss (Janse Van Vuuren et al., 2015). Some dysfunctional eating behaviours, such as binge eating, are physically challenging after a LSG as patients are no longer able to consume an objectively large amount of food in a short period of time. However, food cravings which instigate eating behaviours would not be impacted by the restrictive nature of the LSG. Thus, the intensity of cravings to eat desired foods may not decrease for some patients post-LSG

The construct of food cravings is multifactorial and, thus, examining this construct with the multidimensional questionnaire such as the FCQ–T is important as it may offer a more comprehensive view on eating behaviours that are not disordered in nature but that are associated with negative eating-related choices in LSG patients. It was hypothesized that participants with higher scores on the FCQ-T subscales

indicating more food cravings, would be on a lower weight loss trajectory at 6 months following LSG surgery than the participants with lowers scores. The aim of this study, therefore, was to investigate the predictive ability of the FCQ-T by assessing the relationship between the FCQ-T scores at 4 to 6 weeks post-surgery and early weight loss outcomes at 6 months post- LSG surgery.

8.3 METHODS

8.3.1 Procedure and Participants

The dieticians, nurses or surgeons at four bariatric clinics gave patients information sheets in 2014 at these surgeries if they were over 18 years of age and were considering a primary bariatric surgery. Participants who were interested in the study contacted the researcher to register their interest. The study was explained over the phone to the participant and the participant was then emailed the URL for the online questionnaires and invited to complete it in their own time. Informed consent to access medical records was obtained through the online survey. The same participants were contacted 6 months later to complete the second set of questionnaires. Participants were mailed a AU$20 movie voucher if they completed both questionnaires as a token of appreciation for their participation.

8.3.2 Measures

Self reported details including age, sex, height, preoperative weight, type of bariatric surgery, occupation, marital status and level of education were obtained from each participant or from medical records held at the respective clinics. Participants were required to self report their weight at 6 months post-surgery. See Table 1.

Table 8.1: Participant characteristics

Characteristic	Value
Patients (n)	106
Mean age (yr)	42 (*SD* 10.72)
Female (%)	81
Mean BMI (kg/m^2)	44 (*SD* 7.35)
Mean % EWL at 6 months	64 (*SD* 21)
Mean % TWL at 6 months	26(*SD*5.88)
Working Status (%)	
Employed	80
Not working	20
Level of Education (%)	
High School	30
Post-High school	27
University	42
Marital Status (%)	
Married	42
Defacto / In a relationship	27
Single	19
Divorced	4
Widowed	3

BMI = body mass index; % EWL = percentage of excess weight loss; %TWL = percentage of total weight loss. Data presented as mean with standard deviation, unless noted otherwise.

8.4 RESULTS

In 2014, 132 Participants (113 female) from four sites, completed questionnaires at 4-6 weeks post-bariatric surgery and with 114 of these participants providing their weight at 6 months *(N* = 114) indicating a follow up response rate of 88.4%. Participants partaking at both times predominantly underwent LSG (*N* = 106), three participants underwent Laparoscopic adjustable band (LAGB) and five underwent Roux-en-Y gastric bypass (RYGB). Results of the 106 (92 female) LSG participants who completed questionnaires at both times are reported. The included participants are thus a homogenous sample with regards to type of bariatric procedure.

The FCQ-T measured nine dimensions of food cravings including, (a) an intention and planning to consume food (α = .94); (b) anticipation of positive reinforcement that may result from eating (α = .95); (c) anticipation of relief from negative states and feelings as a result of eating (α = .95); (d) possible lack of control over eating if food is eaten (α = .94); (e) thoughts or preoccupation with food (α =

.95); (f) craving as a physiological state hunger (α = .95); (g) emotions that may be experienced before or during food cravings or eating (α = .94); (h) environmental cues that may trigger food cravings; and (α = .95); (i) guilt that may be experienced as a result of cravings and/or giving into them (α =.95).

Patients lost an average of 64 % EWL (SD = 21%) six months after LSG surgery. Fifteen percent (n =16) of the sample achieved ≤ 40 %EWL. Achieving less than or equal to 40% EWL was included as the outcome variable and the first set of analyses examined the nine subscales of the FCQ-T as potential predictors of that change. Logistic regression was used to examine the relationship between weight loss and the nine FCQ -T variables. Results indicated the overall model was significant, $\chi^2(9) = 17.14$, $p = .047$, Nagelkerke $R^2 = .26$. The Hosmer and Lemeshow test was non-significant, $\chi^2(8) = 11.44$, $p = .178$, indicating a satisfactory model fit. Odds ratios and the associated 95% confidence intervals for each of the nine FCQ - T variables are shown in Table 8.2. Of the FCQ-T predictors, not achieving expected weight loss was only significantly associated with emotional eating (adjusted OR = 4.19, $p = .018$, 95% CI [1.28, 13.71]). For every unit increase in emotional eating, the odds of having an expected weight loss less than 40% increases by 319%.

Table 8.2: Odds ratio estimates and the associated confidence intervals from logistic regression predicting not achieving expected weight loss.

	Adjusted OR	95% CI	p-value
Intentions	0.23	(0.05, 1.05)	.058
Lack of Control	2.46	(0.76, 7.95)	.132
Positive Reinforcement	1.95	(0.48, 7.82)	.348
Negative Reinforcement	0.80	(0.25, 2.51)	.698
Thoughts	0.76	(0.24, 2.4)	.639
Guilt	0.94	(0.46, 1.94)	.867
Emotions	4.19*	(1.28, 13.71)	.018
Cues	0.79	(0.33, 1.92)	.602
Hunger	0.54	(0.16, 1.82)	.317

*$p < .05$.

8.5 DISCUSSION

This longitudinal study investigated the impact of psychological factors such as food cravings that influence eating behaviours in LSG patients with poorer weight loss outcomes at 6 months. The aim was, thus, to investigate negative eating-related choices in those participants on a lower weight loss trajectory who consequently may be at-risk for not achieving expected weight loss outcome in the longer-term. The results showed that the overall model was significant and that, of the factors investigated, emotional eating (see FCQ – T in Appendix J) experienced four to six weeks following LSG may predict poor weight loss outcomes at 6 months.

Prior studies have found emotional eating or eating in response to emotional distress is present in bariatric patients both pre and post-operatively (Rusch & Andris, 2007). Additionally, emotional eating has been identified as a risk factor for poor weight loss outcome after bariatric surgery (Canetti et al., 2009; Grothe, Dubbert, & O'Jile, 2006) and has predicted unsatisfactory weight loss outcomes (Canetti et al., 2009). Crowley et al. (2012) reported bariatric patients who presented with problematic eating behaviours, such as emotional eating and binge eating in a clinical interview, also reported higher FCQ-T scores on subscales measuring cravings related to emotions and binge-eating behaviours. Similarly, in this study, cravings related to emotional eating experienced at 4-6 weeks after LSG is predictive of early poor weight loss outcomes at 6 months post-LSG.

Of further importance is that emotional eating has been implicated in other maladaptive eating behaviours post-operatively such as grazing (Colles et al., 2008b), uncontrolled overeating (Larsen, van Ramshorst, et al., 2004; Rusch & Andris, 2007), and snack eating (Rusch & Andris, 2007) and acts as a trigger for dysfunctional eating (Chesler, 2012). In this preliminary LSG study, the indicators of intensions to eat, positive reinforcement, negative reinforcement, lack of control, preoccupation with food, feelings of hunger, negative affect, and guilty feelings on the FCQ-T were not significantly associated with a lower weight loss trajectory. However, emotional eating post-operatively is related to other disordered eating behaviours. Thus, identifying emotional eating early in the weight loss trajectory is important as dysfunctional eating appears to be associated with weight regain in the longer-term (Meany et al., 2014). This study found that postoperative eating in response to emotional cues in LSG patients negatively impacts the early weight loss

trajectory. Further, given the limited data of the eating behaviours in LSG patients, emotional eating may be an important indicator of the early weight loss trajectory and important in weight maintenance given emotional eating's association with binge eating disorder (BED), grazing, loss of control eating (LOC) and other maladaptive eating behaviours (Fischer et al., 2007).

There are limitations to the current study. The small sample size, all participants were Caucasian and they self reported their weight at 6 months. The short term follow up may be regarded as a limitation as weight loss continues for 24 months post-LSG. However, considering the rate of postoperative weight loss in the LSG, we evaluated the lower weight loss trajectory of a subset of patients at this short-term follow-up especially important. This may be an appropriate time for early intervention of emotional eating in those patients with a lower weight loss trajectory.

8.6 CONCLUSION

This study has identified that experiencing emotions before or during food cravings or eating 4 to 6 weeks after LSG surgery is associated with poorer weight loss outcomes at 6 months.

8.7 DISCLOSURES

The authors declare that they have no commercial associations that might be conflict of interest in relation to this article.

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Chapter 9: General Discussion and Conclusions

Chapter 1 of this thesis highlighted that obesity rates continue to rise worldwide and, in response, primary bariatric and revisional bariatric surgeries incidences have increased. In Chapter 2, a review of the current literature on bariatric surgery patients was provided and as well as the factors that that may contribute to weight loss outcomes postoperatively. In Chapter 3 the methods of data collection were described including details of the participants, materials used, and the procedures undertaken for each study. Chapters 4 to 7 presented the 3 studies in this thesis, which examined the psychosocial presentation of primary, revisional and multiple revisional bariatric surgery patients and the factors that may impact on the early weight loss trajectory post-operatively. This chapter integrates the findings of the program of research, and provides comprehensive recommendations and implications for clinicians and health professionals. The chapter concludes with a discussion of the limitations and strengths of this program of research and the overall conclusions and suggestions for further research in this area.

9.1 INTEGRATION OF KEY FINDINGS

9.1.1 Research aims and research questions

The overall aim of the program of research was to identify and elucidate the psychosocial factors that impact upon the weight loss trajectory of primary and revisional and multiple revisional bariatric surgery patients. These aims were divided into two research questions:

1. What do patients who have undergone revisional and multiple revisional bariatric procedures perceive has contributed to them not achieving an expected weight loss outcome post-LAGB?
2. Can explanatory models (developed from Study 1 & 2) predict the expected weight loss trajectory in patients undergoing a primary bariatric procedure? If so, which psychosocial factors are successful predictors?

The first phase of this program of research comprised Studies 1 and 2, and examined the psychosocial presentation of revisional and multiple revisional bariatric surgery patients utilising qualitative methods (Question 1). The second phase, consisting of Study 3a and 3b, investigated the physiological and psychological eating behaviour factors identified from Study 1 and Study 2 therefore examined what psychosocial factors predicted the early weight loss trajectory in a primary weight loss procedure (Question 2). In the following sections, each of these phases and the insights offered are discussed in turn.

9.1.2 Phase One: What are the psychosocial factors that patients identify as contributing to not achieving an EWL after revisional and multiple revisional bariatric surgery?

Bariatric surgery is currently the most effective and durable intervention for weight loss in patients suffering with obesity and morbid obesity and its incidence has increased exponentially worldwide (O'Brien et al., 2013b). Of the available bariatric procedures, Laparoscopic adjustable gastric band (LAGB), a restrictive procedure, has been the most commonly performed bariatric procedure in Australia for the last decade (Hii et al., 2012a). However, not all patients achieve excess weight loss (EWL) following this procedure, increasing the demand for revisional surgeries. Inadequate weight loss, weight regain, band related difficulties, surgical complications or loss of quality of life are the indications for patients seeking revisional bariatric surgery (Lim et al., 2009).

Recent studies have indicated that, at 18 to 24 months post-LAGB surgery, weight loss stabilises and a significant proportion of patients experience weight regain (Hii et al., 2012a). Other studies report that a growing number of LAGB patients require revisional bariatric surgery for failed excess weight loss (EWL) and unsuitability of the band (Eid et al., 2012). However, obesity is a chronic disease and an estimated 10 – 30% of patients experience some degree of weight recidivism post-operatively, regardless of the type of bariatric procedure, starting as early as 18 months and as far out as 20 years (Daigle et al., 2014; Magro et al., 2008; Sjöström et al., 2012). The type of revisional procedure varies depending on the primary procedure and revisional surgery is significantly more challenging than the initial procedure (Hii et al., 2012a). In addition, the outcome from revisional surgery may be inferior to primary procedures. The indicators of successful weight loss after primary LAGB can be defined as more than 50% EWL or a reduction of BMI to less

than 35 kg/m$^{2.}$. Inadequate EWL and/or failure to maintain EWL are the most common indicators for revisional bariatric surgery. Poor diet quality with excess calories, insufficient physical activity and lack of nutritional counselling are associated with weight regain in this population (Freire et al., 2012). Maladaptive eating behaviours post-surgery such as a loss of control eating (Marino et al., 2012), emotional eating (Bocchieri et al., 2002a), grazing (Colles et al., 2008b) and sweet eating (Burgmer et al., 2005a) have been associated with poor weight outcome prompting some patients to seek revisional surgery to remediate.

Patients presenting for revisional and multiple revisional bariatric surgeries are an understudied population and no studies to our knowledge have examined the unique causes of revisional and multiple revisional bariatric surgery patients experiencing an unsatisfactory outcome. Identifying the factors that contribute to not achieving EWL may be helpful for both prevention and intervention and to improve long-term outcomes and inductive qualitative research has been increasingly being to elucidate the complex experiences and perspectives of bariatric surgery patients (Ogden et al., 2005).

This phase of the research program therefore explored, from an inductive approach, what individuals perceived as the factors that contributed to them not achieving a satisfactory weight loss outcome and therefore seeking revisional and multiple revisional surgeries. Study 1 and 2 used a qualitative methodology to develop two grounded theory models grounded in the patients' own experiences. Study 1 and 2 explicitly focused on the identifying psychosocial factors that contributed to weight loss failure for revisional surgery patients and multiple revisional surgery patients. Examining the potential psychosocial causes of an unsuccessful weight loss outcome in patients who have had multiple revisional weight loss surgeries was important, as it was hypothesised that it may identify unique psychosocial factors, combinations of factors, or intensity of factors that explain these patients' repeated EWL failures. To our knowledge, this is the first study in an Australian setting that has examined if multiple revisional patients have unique psychosocial features that distinguish them from primary revisional bariatric surgery patients.

In Study 1 following the grounded theory analysis of the 23 interviews, a model emerged with core category of unrealistic expectations of LAGB and five

conceptual categories: restriction of band, impacts on social interactions, desire for food choices that give reward, increase in consumption of high calorie dense food choices because of texture and reward, and shame, loneliness and loss. The model developed from Study 1 suggested three important psychosocial vulnerabilities present in the patients who had failed to achieve EWL and had revisional bariatric surgery:

- Unrealistic expectations of LAGB,
- Ongoing and increased consumption of high calorie dense food as a primary coping strategy to cope with negative affect, and
- Feelings of deprivation.

The restrictive nature of the band may, in fact, have facilitated maladaptive eating patterns in this subgroup of patients who had failed to achieve EWL and, thus, elected to have a revisional bariatric surgery. The findings of this causal model offered important insights as to what the patients perceived as the factors that contributed to their failure with the LAGB and decision to have revisional bariatric surgery.

In Study 2, Participants reported 12 key factors that represented their experiences of revisional bariatric surgery. A model emerged grounded in the data, with the core category of unrealistic expectations of weight loss surgery and 11 conceptual categories: interpersonal trauma; unattractive body image as a protection against further emotional and sexual abuse; mental health difficulties; negative affect (shame and loneliness); failure of past surgeries; lack of social support; desire for reward from food; revisional weight loss surgery; change in taste; gap between anticipated and actual experience of reward from food; over eating/uncontrolled eating and perceived unsatisfactory outcome.

The majority of participants reported that they had experienced historical interpersonal trauma which resulted in the development of a negative body image. For some participants, the maintenance of weight was perceived as a protection or shield for unwanted physical and/or sexual advances because of prior trauma abuse. Participants reported long-term psychological consequences as a result of the historical trauma/experiences, which brought about negative affect (depression, anxiety or anger). This negative emotional state was compounded by the failure of

the past surgeries and a perceived lack of social support. Subsequent bariatric surgeries brought about changes in taste and satisfaction from eating. Thus, eating was no longer perceived as an effective coping strategy and the efficacy of the emotional eating to deal with and regulate negative emotional states was diminished. In addition, participants reported that the surgeries did not inhibit their actual eating behaviours. As such, unrealistic expectations of bariatric surgery and emotional eating as a consequence of increased negative affect and historical interpersonal trauma led to participants not achieving a satisfactory psychosocial outcome.

In Study 2, the model developed suggested four important psychosocial vulnerabilities present in the patients who had failed to achieve EWL and had multiple revisional bariatric surgeries:

- Unrealistic expectations of weight loss surgery,
- Historical interpersonal trauma,
- Loss of control, with eating as primary coping strategy to cope with negative affect, and
- Diminished enjoyment of food due to changes in taste and volume.

The findings of this qualitative study offered important insights into combination of factors that contributed to the unsatisfactory outcome and the psychosocial impact of having multiple revisional bariatric procedures.

In both Studies 1 and 2, the participants reported that they found the experience of telling their weight loss journey story cathartic and valuable. Participants reported that they were grateful that this area was being researched and that their story was being heard and that others may benefit from this research project. However, in contrast to Study 1, the participants in Study 2 reported a greater sense of disillusionment in their own ability to address their long standing weight difficulties and participants reported a having a profound feeling of failure.

The grounded theory models developed form both qualitative studies had similarities in their constructs but likewise, and importantly, they had differences. Each of these two qualitative studies in the program of research suggest that patients presenting for revisional and multiple revisional bariatric surgeries had an unrealistic expectation of bariatric surgery. Patients described their hope that surgery itself

would be the miracle cure to their long standing weight and weight related difficulties. In both of the models developed from these studies, the category "unrealistic expectations of LAGB and bariatric surgery" was a core category. Similarly, the elicited constructs and conceptual categories regarding maladaptive eating behaviours post-surgery were similar in both grounded theory models. Collectively, the findings from both qualitative studies suggest the bariatric surgery procedures did not ameliorate the participants' eating behaviour difficulties. The participants in both studies reported a sense of loss of control and, thus, overeating in response to negative emotions. However, the primary revisional model developed from Study 1 differed from the model developed in Study 2 insofar as the participants in the multiple revisional study reported incidences of interpersonal trauma and prior mental health difficulties. Thus, examining the two bariatric populations and comparing the revisional and multiple revisional bariatric surgery patients' psychosocial presentation, provided an opportunity to identify the unique features of each group.

The findings of Study 2, in identifying interpersonal trauma and prior mental health difficulties as only present in the multiple revisional group, concurred with other researchers' findings that obesity can be regarded as an adaptive defence or self-protecting mechanism (Ray et al., 2003; Wiederman et al., 1999). Specifically, in Study 2 the participants who were interpersonal abuse survivors perceived their additional weight as protection from potential sexual advances (Steinig et al., 2012). The participants' responses in Study 2 also identified that the experience of interpersonal trauma as a child or adult resulted in the experience of mental health difficulties and that these prior mental health difficulties were exacerbated by the experience of failure of not achieving a satisfactory weight loss outcome and, consequently, this led to them experiencing increased negative affect. This experience created a distorted relationship with their weight, viewing it both as a form of protection, but also as a measure of personal failure. Subsequently, the experience of failure of not achieving a satisfactory weight loss outcome contributed to feelings of shame and the experience of loneliness. Correspondingly, in Study 1 participants' reported increased negative affect as a consequence of failure to achieve or maintain expected weight loss. Taken together, these findings suggest that patients who experience failure to achieve their weight goals have increased negative affect

as a consequence of this failure. However, participants in Study 1 did not identify interpersonal trauma and, therefore, obesity as a defense mechanism as a factor contributing to their psychosocial outcome. Therefore, it is hypothesized that the participants in Study 2 who had multiple procedures experienced negative affect as a consequence of experiencing failure after revisional bariatric surgeries and the emotional and physical consequences of weight loss triggered maladaptive eating responses such as increased emotional eating.

A large American cross-sectional study conducted by Zhao et al. (2011) examined the relationship between obesity and anxiety in 177,047 adults. A significant positive relationship was observed between self-reported BMI and self-reported but medically diagnosed anxiety disorder for obese (BMI $\geq$ 30) women. Additionally, in a study by Onyike et al. (2003), morbidly obese individuals were five times more likely to be depressed compared to persons with average weight. Lier, Biringer, Hove and Tangen (2011) conducted a meta-analysis of 15 studies prospectively examining the bidirectional relationships between obesity and depression. The findings of the meta-analysis suggested that depression may not only be a psychological consequence of obesity but, importantly, that obesity may be a consequence of depression (Lier, Biringer, Hove, Stubhaug, & Tangen, 2011). Other recent evidence suggests that obese bariatric surgery patients report higher levels of depression, anxiety, and stress and lower scores on self esteem and quality of life than people of normal weight (Abiles et al., 2010). Although the DASS measure in the qualitative Studies 1 and 2 was included as a descriptive measure only to contribute to the description of the participants, the majority of Study 1 participants achieved scores in the normal range for depression, anxiety, and stress. However, 7 of the 23 participants achieved scores in the severe range and 4 in the extremely severe range for anxiety. In Study 2, the majority of the 17 participants had elevated levels of depression and anxiety and stress, with almost a third of the cohort of participants reporting severe levels of anxiety. Taken together, these findings suggest that a high proportion of the patients in this program of research who elected to undergo revisional and multiple revisional procedures had elevated levels of anxiety, depression and stress. In explaining their experience, the participants reported mental health difficulties as a consequence of the experience of failure to achieve EWL and, thus, requiring revisional surgery increased emotional distress and resulted in social

isolation. The finding that increased feelings of shame and loneliness and the perceived lack of social support consequently resulted in social withdrawal was consistent across both studies.

In a recent review article to investigate the relationship between post-operative support groups and other forms of social support on expected weight loss after bariatric surgery, Livhits et al. (2011) suggested that social support may be associated with increased weight loss after bariatric surgery. In their review, a total of 10 studies explored social support and bariatric surgery weight loss outcomes, five of the studies explored the role of support groups and a further five studies explored other forms of social support (such as perceived family support or number of confidants) and expected weight loss outcome post-operatively (Livhits et al., 2011). Livhits et al.'s review found that support group attendance after bariatric surgery was associated with greater post-operative weight loss. Similarly, Vishne et al. (2004) suggested that family and social support may increase the weight loss following surgery by helping patients to deal with psychosocial stressors and dietary changes. In a retrospective cohort study of 450 bariatric patients, Vishne et al. found that those who had social support post-operatively experienced the most satisfactory emotional outcome. Ray et al. (2003) found that bariatric patients have an average baseline of four confidants, and those with greater than nine confidants trended towards greater weight loss ($p = 0.13$). Thus, the perception and experience of social support in different forms may be associated with increased weight loss and contribute to long-term weight maintenance after bariatric surgery. Together, the findings from Study 1 and 2 supports this notion as participants in both studies identified a lack of perceived social support as contributing to an unsatisfactory weight and psychosocial outcome.

Both qualitative studies identified maladaptive eating behaviour constructs as important factors contributing to their psychosocial outcome. For example, desire for food choices that give reward and increase in consumption of high calorie dense food choices because of texture and reward were identified in Study 1. Moreover, in Study 2, the constructs, desire for reward from food, change in tastes, gap between anticipated and actual experience of reward from food and over eating/uncontrolled eating were identified. These constructs identified in both qualitative studies are associated with emotional eating in that the participants' identified specific eating

behaviours and food choices as a method of dealing with negative affect. Thus, eating behaviours were perceived as an attempt to experience relief from negative emotional states in that negative feelings instigated various aspects of eating, including motivation to eat, food choices and volume of food. The elicited constructs and conceptual categories regarding maladaptive eating behaviours from both grounded theory models is consistent with prior research. For example, Chesler (2012) reported that weight loss surgery patients who partook in greater levels of uncontrolled, emotional eating, in response to negative emotions achieved a lower EWL and experienced greater weight recidivism than patients who were not emotional eaters. Collectively, findings from the qualitative studies support the findings of this previous study that a bariatric surgery procedure does not ameliorate eating behaviour difficulties.

Also similar to previous studies, participants in both studies 1 and 2 reported a sense of loss of control and, thus, overeating in response to emotions (Poole et al., 2005; Saunders, 2004). This sense of loss of control was associated with difficulties adjusting to eating smaller volumes of food post-operatively. The psychological adjustment required to the change in portion size is significant post-weight loss surgery, as patients are only able to eat ¼ to ½ a cup of food in one sitting. Thus, patients are encouraged to eat smaller meals five times per day and not eat and drink together. Participants in both studies reported overeating in response to the experience of negative affect. This finding is consistent with other studies as negative emotional eating behaviours in both Study 1 and 2 were indicated as a risk factor for not achieving EWL post-bariatric surgery. Additionally, the maladaptive eating behaviours were identified in both studies as negatively impacting on the weight maintenance trajectory.

From a theoretical perspective, binge eating develops as a consequence of excessive restriction either of calories or types of foods (Fairburn et al., 2003). In these two sub groups, a perpetuating cycle of behaviour of rebound eating developed. In response to the restriction of foods both in variety and quantity, the participants reported an increased consumption of specific high calorie dense foods. The increase in restriction of the LAGB due to inadequate weight loss or weight regain reduces the volume of foods and types of foods maintaining the maladaptive eating cycle. As a consequence of the increased feelings of deprivation, there is an increased need for

soothing from high calorific foods that can be ingested. Thus, the eating of high calorific foods is a method of coping with the negative affect and deprivation by providing comfort. As in other studies, participants reported emotional eating or eating in response to emotional distress as a historical coping strategy that was still prevalent post-surgery and was indicated as a risk factor for not achieving EWL post-bariatric surgery. Therefore, the findings of both qualitative studies support this theory as the restrictive nature of the primary LAGB facilitated the development and maintenance of maladaptive eating patterns.

Of interest to note is that across both studies there was a development of an increased reliance of high calorie dense foods with specific textures and taste. However, the unexpected experience of taste changes and the restriction in the ability to eat the volume of food that participants had been able to eat prior to bariatric surgery resulted in a gap between the anticipated and actual experience of reward from food. Consequently, participants reported that they mourned their prior relationship with food and were dissatisfied with process of eating. Taken together, these findings highlight the importance of patient-reported outcomes on the process of enjoyment and satisfaction with eating. Thus, it is hypothesised that, post-LAGB, patients modify their eating preferences both in taste and textures in response to the restriction of the band, leading to maladaptive eating patterns of high caloric foods. Other findings have similarly suggested that patients struggling with obesity report higher hedonic hunger and higher enjoyment for sweetness and fatty tastes compared with normal weight subjects (Bartoshuk et al., 2006). Of interest is that RYGBP was the most prevalent revisional surgery following a failed LAGB in the qualitative studies and this surgery is associated with decreased hedonic enjoyment of sweet or highly palatable foods (Ochner et al., 2011). Thus, the LAGB surgery may facilitate the development of maladaptive eating patterns and encourage the eating of high calorie dense foods. In contrast, the revisional RYGB may, in some patients, decrease the hedonic enjoyment of sweet and fatty foods and thus, ameliorate this disordered eating pattern.

In summary, Studies 1 and 2 identified several factors that patients reported as contributing to them seeking revisional bariatric surgeries. These qualitative studies have provided a rich description of these factors and both models have highlighted that primary bariatric surgery patients have unrealistic expectations of the surgery,

and that weight loss surgery itself may instigate, facilitate, reinforce, or contribute to the development of maladaptive eating behaviours. In particular, the model developed in Study 2 has highlighted the significant impact the experience of repeated weight loss failure has on this vulnerable population. To my knowledge, no studies appear to have explored these factors in revisional and multiple revisional bariatric surgery patients and, thus, both qualitative studies have added to the existing literature by providing a unique explanation from a patient perspective. The explanatory grounded theory models developed can be utilised in a number of ways. They can be used by therapists and health care professionals to normalise the experience of failure for patients who have not achieved EWL postoperatively. Further, they may assist therapists in helping patients identify the factors that may be pertinent to their individual experience and provide a framework for the development of intervention for patients at-risk of not achieving EWL. Further, the findings from these qualitative studies highlight the importance of an interdisciplinary approach to revisional and multiple revisional bariatric surgeries. Finally, these explanatory models identify psychosocial factors to be examined in future research.

9.1.3 Phase Two: What identified factors from the prior qualitative studies predict the early weight loss trajectory in a primary bariatric procedure?

Study 3, a quantitative study, utilised a longitudinal design to identify the beliefs and experiences of primary bariatric surgery patients regarding their psychosocial presentation in relation to EWL. The qualitative studies examined revisional and multiple revisional bariatric surgery patient's psychosocial presentation after a failed primary LAGB. Consequently, Study 3 applied findings from Studies 1 and 2 to test the constructs identified in the causal model/s, aiming to identify the psychosocial factors that predict patients' early weight loss trajectories in a primary bariatric procedure.

Of the 132 participants who initially took part in Study 3, eight participants were excluded as they had undergone a primary LAGB or RYGB. These eight participants were excluded to allow for a homogeneous sample group. Therefore, the 106 participants that were included had the same type of bariatric procedure, namely the LSG. Further, the participant demographics in Study 3 are reflective of the LSG procedure now being the most popular procedure being performed worldwide and in Australia (Australian Government, Medicare Data). The Laparoscopic adjustable

gastric band (LAGB), a restrictive procedure, had been the most commonly performed bariatric procedure in Australia for the last decade (Hii et al., 2012a). Until recently, RYGB was considered the gold standard intervention for obesity as it had the most robust results for long-term clinical outcomes. However, the sleeve gastrectomy (LSG) has now attained the status of a valid alternative to RYGBP, and importantly has overtaken the LAGB worldwide in the hierarchy of bariatric surgical interventions (Nedelcu et al., 2015). In contrast to the LAGB's restrictive nature regarding the limited textures and food types, LSG patients (4 to 6 weeks postoperatively) should be able to eat ¼ to ½ cup of a variety of food types and textures 5 to 6 times per day (M. Graham, Personal communication, August 23, 2013). Further, the LSG offers a better quality of life over gastric banding in that patients have a more normalized eating pattern (Noel et al., 2014). Moreover, the LSG is perceived as less invasive, technically simpler and easier to perform when compared with Laparoscopic Roux-en-Y gastric bypass (RYGB). Additionally a meta analysis which compared the outcomes of LAGB and LSG in terms of excess weight loss (EWL) concluded that the LSG had a greater effect on morbid obesity in terms of EWL (Wang et al., 2013). Taken together these studies provide support for the notion that the LSG is the now the most popular method of weight-loss surgery in USA and Australia, as it is a promising bariatric procedure and provides effective weight loss and resolution of co- morbidities for 3-5 years (Australian Goverment, 2015; Farrell et al., 2009).

In the bariatric surgery literature, % EWL is commonly used as the measure of weight loss success (EWL> 50 %) or weight loss failure (EWL ≤50%) (Livhits et al., 2010). Approximately 15% to 20% of primary bariatric surgery patients fail to achieve adequate % EWL. However, there is a paucity of research into the psychosocial factors that promote or hinder their weight loss trajectory and influence this outcome. Recent studies have attempted to identify what psychological factors predict the early weight loss trajectory in primary weight loss procedures and have concluded that an active coping style (attempt to utilize own resources to deal with a problem situation or stressor) might be of predictive value for better weight loss outcomes following LSG intervention (Figura et al., 2015). Given the exponential increase in rates of worldwide obesity and the resulting increase in both primary and revisional weight loss surgeries and in particular the increase in LSG, additional

research is required. Thus, it is important to gain a better understanding of these factors and their impact on the early LSG weight loss trajectory as identifying these factors may be helpful for both prevention and intervention and, thus, offer improved long-term weight loss outcomes following LSG.

Specifically, Study 3 was an online survey to measure the experiences and behaviours of patients within 4 to 6 weeks following primary bariatric surgery. This time frame was identified as being important, as the LSG patients would be able to eat and drink normally at this time. At 4 to 6 weeks post-surgery, the portion size of food is restricted rather than the variety of foods. The second time point for data collection in Study 3 was chosen as the majority of the weight loss occurs in the first 6 months post-LSG. Thus, these times frames were identified as being important in order to examine how these factors contributed to the participants achieving a poorer than expected weight loss outcome over a 6-month follow-up period, as defined by % EWL. The survey at Time 1 (4-6 weeks) was based upon the concepts generated from the first two qualitative studies and included: social support; activity levels; locus of control; changes in perception of taste; emotional eating; eating behaviours, mental health and food cravings. Validated measures of these constructs were employed in this quantitative study. However, as an appropriate validated measure was not available to investigate the changes in perception of taste post-bariatric surgery, the Taste Desire and Enjoyment Questionnaire Scale (TDEQS) was developed to investigate this construct. Further, a measure to investigate the construct, "unrealistic expectations of weight loss surgery", was not available. However, this construct is suggestive of an external locus of control and therefore the Internal versus External Control of Weight Scale was used to investigate this construct. In the initial bivariate correlations with weight loss outcome at 6 months post-LSG, the constructs locus of control, mental health, perceived social support and activity levels did not reach significance. These important constructs identified in the qualitative studies as factors contributing to an unsatisfactory psychosocial and weight loss outcome post-revisional and multiple revisional bariatric surgery should be examined in future longer-term studies of primary bariatric patients. Although the role of physical activity has been clearly demonstrated in the literature in its importance in losing and maintaining weight loss post-bariatric surgery, this program of research did not explore the role of physical activity as it was not identified by

participants in the qualitative studies as a construct contributing to weight loss outcomes. Further, at the time of completion of the initial questionnaires (4 - 6 weeks post-surgery) participants would not have been advised by their medical team to recommence or commence physical activity. Although the construct of interpersonal trauma was identified as an important construct in the qualitative Study 2, it was not investigated as a predictor variable in Study 3. Given the design of the study (i.e., an online survey) it was not possible to provide support to those patients, who may have become distressed in recounting their experience of interpersonal trauma. Thus, because of the sensitive nature of the construct, and the limitations of the design, it was not investigated in Study 3. Study 3a examined the physiological factors related to taste and Study 3b examined the psychological eating-related factors and their relationship to EWL.

Study 3a

Taste changes were identified inductively from the qualitative studies as a factor contributing to food preferences and satisfaction with weight loss outcome post-LAGB. Thus, it was hypothesized that LSG patients may experience taste changes post-surgery and that those who experience changes to the taste and desire and enjoyment of high calorific foods may achieve better weight loss outcomes in the longer-term post-bariatric surgery. Therefore, the aim of Study 3a was to investigate the patient-reported physiological outcomes of changes in taste, enjoyment and desire of foods at 4-6 weeks and 6 months post-LSG. A secondary aim was to examine quality of alimentation, and in particular satisfaction with eating. Changes in taste and enjoyment of foods was identified in qualitative studies as being important and leading to overeating and to experiencing disappointment in the experience of eating. Participants in the qualitative studies identified that the change in their relationship with food and the change in the experience of eating not only increased their negative affect, but diminished the efficacy of emotional eating. It was predicted that LSG patients' perception of taste, desire and enjoyment of foods would change post-LSG.

The findings of this longitudinal study indicated that subjective changes in taste, desire and enjoyment of flavours of eight taste modalities were very common after LSG. The results of this study were varied, with some participants reporting unchanged tastes, others' tastes increased and others reporting reduced tastes across

eight taste modalities. However, the majority of participants reported an increase in the intensity of sweet and fatty flavours at both time points and an increased acuity of spicy and fatty tastes over time. Additionally, these results showed a decrease in palatability of high calorie dense sweet and fatty foods initially post-LSG. This study demonstrated, in addition to an increase in intensity of sweet and fatty flavours, participants reported a decreased enjoyment for fatty and sweet flavours and decreased desire for fatty and sweet flavours at both time points. This study found a decrease in desire for both sweet and fatty flavours post-LSG and a decrease in desire and enjoyment of all taste modalities except salty and savoury flavours. Additionally, the desire for sweet, bitter and metallic tastes changed over time. No prior study has explored the change in taste, desire and enjoyment of flavours across eight taste modalities, and across two time points in LSG patients.

Although these findings offer new insights regarding the experiences of patients following LSG, the involvement of taste change in assisting or hindering EWL is unclear. In contrast to the patient reports in Studies 1 and 2, the relationship between taste and desire change and %EWL in Study 3a was non significant and the bivariate correlation between savoury enjoyment and %EWL at 6 months post-LSG surgery was negative and weak. Further, that the change over time (time 2 - time 1) of savoury enjoyment was weakly associated with %EWL. Additionally, in this study, satisfaction with eating was weakly associated with changes in taste, as greater satisfaction of eating behaviours was associated with increased change of intensity of tastes. However, in contrast, participants who were satisfied with their eating behaviours had a decreased desire for specific flavours.

This preliminary study investigated the patient-reported outcomes of changes in taste, enjoyment and desire of foods at 4 to 6 weeks and 6 months post-LSG. Changes to the perception savoury enjoyment at 4 to 6 weeks post-surgery was weakly associated with %EWL at 6 months and post-LSG. Further, that the change over time (time 2 - time 1) of savoury enjoyment was weakly associated with % EWL. Although these findings offer new insights regarding the experiences of patients following LSG, the involvement of taste change in assisting or hindering EWL unclear. A factor that was not addressed by Study 3a but may explain these differences between these findings and the findings from Studies 1 and 2 relates to physical changes in food restriction post-LSG. Following LSG, the portion size is

restricted to approximately ¼ to ½ cup of food in one meal but the portion size gradually increases after the first 12 months to approximately one cup of food per meal as a result of sleeve dilation (M. Graham, Personal communication, August 23, 2013). Thus, food choices are of greater importance after the initial 12 months because majority of patients are able to eat a larger portion of food. Therefore, the length of time from bariatric surgery might be an important factor that illuminates the relationship between taste change and % EWL. Therefore, further research should investigate whether the findings of this preliminary study that changes in taste sensitivity and decreased desire and enjoyment of high calorific foods translate into long-term changes in food preferences. Longer-term research post-LSG surgery would enable a clearer understanding of the impact of taste changes on weight loss and weight maintenance in the longer-term.

Investigating satisfaction with the process of eating was a secondary aim of Study 3a as this construct was identified as contributing to the unsatisfactory outcome in the prior qualitative studies. The participants reported (time 1, time 2), average (40%, 37%) good (33%, 42%) and excellent (15%, 11%) satisfaction with eating at both time points, respectively. Thus, the majority of the LSG patients were satisfied with their quality of eating at both time points. In the prior qualitative Study 2, the participants' reported an inability to experience satisfaction with the process and quality of eating due to the taste and volume changes post-revisional surgery which, in turn, increased their negative affect and perpetuated the maladaptive eating cycle. Thus, examining these factors such as taste desire and enjoyment and satisfaction with eating was identified as being important as they have the potential to impact and influence the relationship with food.

Study 3b

The purpose of this manuscript in the thesis was to ascertain the psychological eating behaviour factors that predicted patients' early weight loss trajectories in a Laparoscopic sleeve gastrectomy (LSG). A total of 106 participants' data was included in this study. The aim was to investigate negative eating-related choices in those participants on a lower weight loss trajectory who consequently may be at-risk for not achieving expected weight loss outcome in the longer-term.

This longitudinal study investigated the impact of psychological factors such as food cravings that influence eating behaviours in LSG patients with poorer weight

loss outcomes at 6 months. Findings from grounded theory models developed in Studies 1 and 2 were applied to identify the psychosocial factors that predicted patients' early weight loss trajectories following primary bariatric procedures. The eating behaviour constructs identified in the qualitative studies were multifactorial and, thus, examining these constructs with the multidimensional questionnaire such as the FCQ–T was important as it investigated eating behaviours that were not disordered in nature, but that may be associated with a range of negative eating-related choices post-operatively in bariatric surgery patients. Thus, all the nine dimensions of the FCQ–T: intentions to consume food, anticipation of positive reinforcement, relief from negative states, lack of control over eating, preoccupation with food, hunger, emotions, cues that trigger cravings, and guilt were included. In the initial bivariate correlations with weight loss outcome at 6 months post-LSG, the constructs locus of control, mental health, perceived social support did not reach significance. However, the construct of emotions that trigger eating did reach statistical significance. Failure to achieve expected weight loss was not significantly associated with intentions, positive reinforcement, negative reinforcement, thoughts, guilt, cues, or hunger. This study identified those patients on a lower postoperative weight loss trajectory of >40% EWL at 6 months had a significant inverse relationship with postoperative emotional eating. This statistically significant finding suggests emotional eating behaviours may be present earlier for those on a lower weight loss trajectory post-operatively. Further, the findings of this quantitative study indicate that bariatric surgery patients who partake in emotional eating are less likely achieve EWL in the longer-term given that the majority of the weight loss post-LSG surgery occurs in the first 6 months.

9.1.4 Integration of findings from Phase One and Two

All the participants (n = 40) of Phase 1 of the program of qualitative research had a failed primary LAGB and the participants (n = 114) of Phase 2 that were included in the results had a primary LSG. The type of bariatric surgery procedure in the Phase 2 participant cohort is reflective on the LSG procedure now being the most popular procedure being performed worldwide and in Australia. Although their mechanisms of weight loss are similar, the restriction of the LAGB can be adjusted and, importantly the LSG offers improved satisfaction with eating over LAGB in that patients have a more normalized eating pattern (Noel et al., 2014). According to

results from the qualitative studies, the restrictive nature of the band may, in fact, have facilitated maladaptive eating patterns in the revisional patients. In contrast, the greater majority of the LSG patients were satisfied with their quality of alimentation at both time points. Thus, the type of bariatric procedure itself may play an important role in not achieving a successful outcome and may have contributed to the different results achieved in the qualitative and quantitative studies.

Additionally, the average time lapsed since the failed LAGB was 4 and 5 years, respectively, in the qualitative studies. In comparison, the quantitative study time frame was 6 months after the initial surgery and, thus, these patients were in the early stages post-bariatric surgery and would not be identified as not achieving EWL until post-24 months. Thus, the primary LSG cohort had not experienced failure, in contrast to the revisional and multiple revisional cohorts' repeated experience of failure in their weight loss trajectory. Further, Study 1 and 2 included only those participants who had not achieved EWL and Study 3 included both successful and unsuccessful EWL participants. Thus, the timeframe since surgery and the difference in cohorts, may have contributed to the different results achieved in the qualitative and quantitative studies. Further, the qualitative studies identified social support and aspects of mental health as being important as a consequence of failure to not achieving EWL. Therefore, the timeframe since surgery, only having primary bariatric surgery and the lack of experience of repeated failure may have contributed to patients' locus of control, social support, and mental health being non significant in the initial bivariate correlations with % EWL in the early weight loss trajectory of the LSG patients. However, the impact of these individual constructs and their interactions in the longer-term are unknown and follow-up studies are needed to further clarify these relationships.

Another important consideration in understanding these findings is that the greater majority of the participants in all three studies were women, congruent with prior studies indicating that women struggling with obesity are significantly more likely to seek treatment for obesity and elect to have bariatric surgery (Mahony, 2008; Sarwer, Wadden, & Fabricatore, 2005). For this program of research, and across all three studies, a minority of participants were male. These results are congruent with clinical practice, with many more women presenting to discuss

primary bariatric surgery and pursue revisional and multiple revisional bariatric surgery for inadequate weight loss or weight regain.

A majority of the participants in all three studies were in a relationship or married and were working. However, a difference identified in the demographics of the participants is their level of education. A majority of the participants in the qualitative studies reported having a secondary education and, in contrast, a majority of the quantitative studies, a tertiary education. Junior et al. (2011) reported that having a lower level of education was identified as being important in outcomes after two years in the weight loss trajectory. Thus, participants' level of education may be important in weight loss outcomes in the longer-term and, thus, may account for some the differences in the findings in the qualitative and quantitative studies. This finding indicates that this is also an area requiring further investigation.

The elicited constructs and conceptual categories regarding maladaptive eating behaviours from both grounded theory models (Studies 1 and 2) and the related quantitative findings (Study 3a/b) are consistent with prior research. For example, Chesler (2012) reported that weight loss surgery patients who partook in higher levels of uncontrolled, emotional eating, in response to negative emotions achieved a lower EWL and experienced greater weight recidivism than patients who were not emotional eaters. Collectively, findings across the program of research support Chesler's findings that bariatric surgery does not ameliorate eating behaviour difficulties. This finding supports the notion that additional psychological support is required to assist at-risk patients in developing adaptive positive coping strategies to address emotional eating.

In the preliminary LSG study (Study 3a), the indicators of intentions to eat, positive reinforcement, negative reinforcement, lack of control, preoccupation with food, feelings of hunger, negative affect, and guilty feelings, measured by the Food Cravings Questionnaire (FCQ-T) were not significantly associated with a lower weight loss trajectory at 6 months post-surgery. However, prior studies have shown that postoperative lack of control is a prospective predictor of significantly poorer post-surgical weight and psychosocial outcomes at 12 and 24 months following bariatric surgery (e.g., White et al., 2010). While recent studies suggest that that eating behaviour difficulties, such as binge eating, remit for the first 6-12 months post-surgery (Boan et al., 2004; Bocchieri-Ricciardi et al., 2006; Colles et al., 2008b;

Green, Dymek-Valentine, Pytluk, Le Grange, & Alverdy, 2004; Malone & Alger-Mayer, 2004; White et al., 2010), other studies suggest that problematic eating behaviours are related to a higher risk for weight regain in the longer-term and, if present, typically occur at 18-24 months post-surgery (Hsu et al., 2002; Kalarchian, Wilson, Brolin, & Bradley, 2000; Larsen, van Ramshorst, et al., 2004; Saunders, 2004). Together, these studies suggest that although problematic eating behaviours initially subside following bariatric surgery, they may return 18-24 months later. Thus, these findings suggest that after initial rapid weight loss in the first 6 months post-surgery, problematic eating behaviours remerge and the maladaptation to a new eating pattern may result in not achieving EWL or in weight maintenance difficulties. Collectively, the findings from the program of research supports this notion and provides an explanation for the differing findings of the qualitative and quantitative studies in that these identified eating behaviour difficulties identified as important in the qualitative studies may present at a later time (beyond the time frame of Study 3) in the LSG weight loss trajectory of at-risk patients.

A key finding of this program of research is that cravings related to emotional eating experienced immediately after LSG are predictive of early poor weight loss outcomes at 6 months post-LSG. This finding is of importance as emotional eating has been implicated in other maladaptive eating behaviours post-operatively such as grazing (Colles et al., 2008b; Rusch & Andris, 2007) uncontrolled overeating (Larsen, van Ramshorst, et al., 2004; Rusch & Andris, 2007), and snack eating (Rusch & Andris, 2007). Additionally, recent studies have found that emotional eating acts as a trigger for dysfunctional eating (Chesler, 2012). Thus, this program of research explains prior research that emotional eating is a risk factor for poor weight loss outcome after bariatric surgery (Canetti et al., 2009; Grothe et al., 2006) and has predicted unsatisfactory weight loss outcomes (Canetti et al., 2009). Thus, identifying emotional eating early in the weight loss trajectory is important, as dysfunctional eating appears to be associated with weight regain in the longer-term (Meany et al., 2014).

The prior qualitative studies in this program of research identified that bariatric surgery brought about changes in patients' relationship with food. In particular, the participants in Study 2 interpreted the experiences of eating as less enjoyable. Therefore, it is hypothesized that if participants mourned the loss of enjoyment they

consequently did not lose weight as they continued to eat in an attempt to regain this enjoyment. In contrast, if participants accepted this change, then they ate less and correspondingly lost weight. Participants found that tastes changed, and thus, there was a diminished satisfaction resulting from the experience of eating. Prior research has indicated that taste is an important factor governing eating behaviour as it contributes to food preference and it is thought that it can modulate appetite and caloric intake (Berthoud & Zheng, 2012). Previous research has shown that patients suffering with obesity report higher hedonic hunger and higher enjoyment for sweetness and fatty tastes compared with normal weight subjects (Bartoshuk et al., 2006). As stated earlier, the RYGBP was the most prevalent revisional surgery post-failed LAGB in the qualitative studies and is associated with decreased hedonic enjoyment of sweet or fatty highly palatable foods (Ochner et al., 2011). Similarly, a recent study also reported changes in taste perception post-RYGBP, with patients reporting an increased preference for lower fat and less sweet tasting foods and reported finding the eating experience less enjoyable (Behary & Miras, 2015). The findings of the quantitative study in this program of research (Study 3) extended this notion in that, as with patients' experience following RYGBP, there is an alteration to the taste, desire and enjoyment of flavours post-LSG.

The qualitative studies in this program of research provide support for the notion that the emotional eating cycle follows a circular pattern and is reinforced through repetition (Chesler, 2012), and therefore, eating in response to negative emotions resulted in an unsatisfactory weight loss outcome. Additionally, in these qualitative studies 1 and 2 emotional eating was identified as method of coping with negative affect by providing comfort and this finding was consistent with other studies where eating in response to emotional distress was reported by participants as a historical coping strategy that was still prevalent post-surgery (Fairburn et al., 2003).

In summary, the grounded theory models confirmed the importance of understanding revisional and multiple revisional bariatric surgery patients' needs and vulnerabilities and identified that it is not only their unique psychosocial factors but that combinations of these identified factors, and the increase in intensity of factors contributed to these patients' repeated EWL failures. Of particular importance from this program of research is that the participants in the multiple revisional qualitative

study reported an inability to experience satisfaction with eating due to taste and volume changes, which in turn, increased their negative affect and perpetuated emotional eating behaviours. In the quantitative studies, tastes, desire, and enjoyment changes occurred but emotional eating predicted weight loss outcome. The quantitative studies highlighted that the factors leading to an unsatisfactory weight loss outcome are multifactorial, complex and may be exacerbated or instigated by the type of bariatric surgery itself, the timeframe since surgery or as a consequence of the process of weight loss or weight loss failure. Taken together, the findings of this program of research suggest that taste, desire and enjoyment changes, and satisfaction with eating post-bariatric surgery may diminish or exacerbate the anticipated relief from negatives states offered by eating (i.e., emotional eating) in at -risk patients and may impact on the long-term weight loss outcome.

9.2 CLINICAL IMPLICATIONS AND RECOMMENDATIONS

The findings of this program of research have clinical implications and offer recommendations for clinicians, particularly in assisting patients in understanding, adjusting to, and coping effectively with the social, emotional, and physical changes and challenges that they may experience post-primary, revisional and multiple revisional bariatric surgery. Further, the findings aid clinicians to provide more targeted information, make recommendations and implement interventions for primary bariatric and revisional surgery patients. Additionally, the findings provide recommendations that may contribute to decisions made by medical teams when screening patients who present for primary bariatric surgery, but in particular those patients presenting for revisional and multiple revisional bariatric surgery.

According to The Obesity Society and The American Society for Metabolic & Bariatric Surgery guidelines, a psychosocial-behavioural evaluation which assesses environmental, familial, and behavioural factors should be required for all patients before bariatric surgery and, therefore, in the US, approximately 90% of bariatric surgery programs require their surgical candidates to undergo a mental health evaluation preoperatively (Mechanick et al., 2013). In contrast, no such pre-operative requirement exists in Australia and, consequently, these evaluations do not occur as standard practice in Australia. Currently, in Australia it is the decision of the individual bariatric surgeon whether or not to include a psychologist in the

interdisciplinary team. Currently, there is only a very limited number of psychologists working as part of the interdisciplinary bariatric teams. Additionally, there is no requirement for revisional or multiple revisional bariatric surgery patients to have a psychosocial-behavioural evaluation prior to having a revisional or multiple revisional procedure as a consequence of not achieving EWL in Australia. The findings of this program of research highlight the importance of this research, and it is thus important for the professional associations for Australian bariatric surgeons to consider the role of psychologists in providing support to at-risk patients and the importance of the psychosocial assessment in bariatric procedures.

9.2.1 Importance of Locus of Control

Overall, the findings from Studies 1 and 2 are similar in terms of the construct of locus of control. Collectively, they suggest that patients presenting for revisional and multiple revisional bariatric surgeries have an unrealistic expectation of bariatric surgery, which is based upon an external locus of control. Revisional bariatric surgery patients had an expectation that bariatric surgery was the panacea to all their difficulties across a number of domains. Thus, there is an expectation that the surgery itself will make the necessary changes that will result in lifestyle and behavioural changes to achieve weight loss, but most importantly, to maintain weight loss after bariatric surgery. There needs to be a clear discussion with patients from the outset of a bariatric procedure that the surgery is not a miracle cure for their struggle with chronic obesity, rather that it is one part of a collaborative process involving the surgeon's and the patient's contributions. Consequently, revisional and multiple revisional bariatric patients need to be assisted to understand the role of the weight loss surgery and be made cognisant of their individual role in the process. Weight loss surgery patients may benefit (in terms of improved outcomes) by considering that bariatric surgery is not an "event" but part of a collaborative process. Additionally, patients should be made aware of the risk of weight recidivism post-bariatric surgery and encouraged to develop plans that include psychological strategies, such as self monitoring and planning for relapse. Planning for relapse may further highlight to patients that bariatric surgery is not a miracle cure. It may be prudent to inform bariatric surgery patients about the importance of behavioural changes regarding their choices in relation to high calorie dense foods and liquids as this is clearly identified as influencing weight loss trajectory. Patients also need

opportunities to be informed regarding the importance of developing adaptive coping strategies to avoid emotional eating in order to achieve EWL and maintain weight in the long-term. Primary LAGB revisional bariatric surgery patients also need opportunities to become aware of the maladaptive eating patterns that may have developed as a consequence of the restriction of the initial LAGB in order to seek support in developing a healthy relationship with food, post-revisional surgery that includes a wide variety of textures and flavours.

9.2.2 Taste Changes

Taste changes were identified as part of the experience of an LSG procedure. LSG patients need to be informed of the possibility of taste changes post-LSG at a most basic level to support informed patient consent. Additionally, an awareness of these taste changes may be an added, but not quite yet understood benefit of LSG that may aid weight loss or assist with weight maintenance in the longer-term. Further, not being aware of these possible taste changes may be distressing and decrease the enjoyment of eating and, thus, impact on satisfaction with eating. Therefore, it may be helpful for clinicians to inform patients prior to surgery of possible taste changes after LSG to assist patients in changing their eating behaviours and adopt healthier food preferences. Furthermore, it would be useful to investigate these factors in the longer-term and, in particular, examine if taste change and subsequent food preference changes predict weight loss outcome in the longer-term.

9.2.3 Pre-surgical Screening to Identify Areas of Support

The qualitative studies in this program of research highlighted the importance of the screening of bariatric patients, in particular those presenting for revisional surgery, both before and periodically after surgery to identify those with an unrealistic expectation of weight loss surgery, experience of interpersonal trauma, tendency for emotional eating, experiencing loss of control eating and inadequate social support. Bariatric patients identified with these expectations and experiences are likely to require support in developing adaptive coping strategies to assist with emotional eating and loss of control eating behaviour. Additionally, all patients are likely to need the opportunity to be informed about necessary behavioural changes regarding the choices of high caloric foods and possible taste changes to achieve success and maintain weight in the longer-term. Patients are also likely to benefit from the opportunity to be informed of the possible negative impact of weight

homeostasis on the rate of weight loss post-revisional and multiple revisional bariatric surgeries. In addition, in supporting patients, the psychological distress and sense of failure in having revisional and multiple revisional bariatric surgeries to achieve weight loss outcome should not be underestimated. Consequently, it may be prudent for health professionals, and in particular bariatric surgeons, to be cognisant of the psychological impact on this vulnerable population of not achieving EWL and, therefore, recommending that seek psychological support prior to revisional and multiple bariatric surgery.

9.2.4 The Impact of Emotional Eating

Emotional eating was identified in all three studies as a negative indicator of weight loss, post-surgery. Patients identified as engaging in emotional eating are likely to require intervention in developing adaptive coping strategies to assist with emotional eating in order to achieve success and maintain weight loss in the long-term. Given these factors' identified role in weight maintenance in the literature, longer-term follow up and education is paramount. Study 3 identified specific food craving traits in that those patients who engage in emotional eating may be at-risk for poorer weight loss outcomes at 6 months post-LSG. Additionally, Study 3 highlighted the eating behaviours of patients who may be more successful with early weight loss. Identifying these negative eating behaviours is important as the majority of the weight loss occurs in the first 6 months post-LSG. Eating in response to emotional triggers following bariatric surgery significantly predicted a poorer early weight loss trajectory. Therefore, this problematic eating behaviour represents an important area for early and longer-term psychological intervention. Thus, by identifying and intervening for negative emotional eating as a historical maladaptive coping mechanism, mental health professionals and clinicians can provide early and effective intervention. Exploring emotional eating behaviours as an area for clinical intervention may offer further understanding of how to support patients who struggle with emotional eating and its subsequent impacts on failure to lose or maintain EWL.

9.2.5 The Importance of Social Support

Studies 1 and 2 identified patients' lack of perceived support as important in contributing to their unsatisfactory outcome. Thus, ensuring that patients have adequate additional support to prepare them and help them to cope with the dramatic lifestyle and behavioural changes and challenges that they will encounter post-

operatively may augment outcomes. Bariatric surgery practices should be encouraged to provide appropriate support groups. Further, patients should be encouraged to attend these support groups as they are an ideal platform to provide appropriate psychological and dietetic support for bariatric patients. Support groups are reciprocal in nature in that patients can share experiences in a supportive environment and thus both give and receive support.

Bariatric surgery patients frequently have specific weight loss expectations and that the surgery itself will address their long-standing difficulties with weight. In particular, those patients presenting for revisional and multiple revisional procedures need to be made cognisant of the impact of weight homeostasis on the weight loss trajectory and the importance of making lifestyle and behavioural changes post-surgery. The typically lower rate of weight loss of a revisional procedure compared to a primary procedure also needs to be clarified. As such, difficulties accepting this slower rate of weight loss, post-surgical results and unmet expectations may result in increased negative affect such as frustration and distress and exacerbate or act as a trigger for any prior mental health difficulties. As highlighted above, the psychologist's participation in a bariatric surgery as part of an interdisciplinary team is very limited in practice and there is currently no requirement or recommendation in Australia for primary, revisional or multiple revisional bariatric surgery patients to undergo psychosocial-behavioural evaluation or seek psychological support. Given the trend of increasing obesity in Australia and the substantial increase in the number of bariatric surgeries, revisional, and multiple revisional procedures being performed, further psychological research and empirical evidence is required to support the role of psychologists in this burgeoning area.

9.3 THEORETICAL CONTRIBUTIONS

The program of research makes several unique contributions to the current theories explaining obesity. Studies 1 and 2 were inductive in approach and, in taking a psychosocial focus, it was deemed most appropriate to ground the findings in the experiences and perspectives of bariatric participants who had undergone a primary and or multiple procedures and had not achieved a satisfactory weight loss outcome. The constructs elicited from the initial studies lend support to the locus of control framework from Rotter's (1966) social learning theory, the biopsychosocial approach to explaining obesity (Christakis & Fowler, 2007; Marti et al., 2004), an addiction

model of obesity (da Silva & da Costa Maia, 2012b) and the restraint theory (Larsen et al., 2007). The final study was deductive in approach and examined the constructs elicited in the qualitative studies of cohort of primary LSG patients.

9.3.1 Social Learning Theory

Both qualitative studies highlight that the construct of external locus of control is relevant in the prediction of those who are likely to fail to achieve EWL. This externalised thinking pattern indicates limited ownership in making lifestyle and behavioural changes post the primary LAGB. This interpretation aligns with Rotter's Social Learning Theory's (1966) notion of internal and external locus of control. According to Rotter, locus of control is described on a continuum and refers to the beliefs individuals have in the amount of control they have over their lives, and can predict and explain health-related behaviours and choices. Locus of control is an important characteristic in relation to obesity because, as described above, it indicates whether an individual believes that the solution to obesity lies in his or her environment or the choices that are made by that individual (Neymotin & Nemzer, 2014). In the qualitative studies in this program of research, an unrealistic expectation of bariatric surgery was identified, and this also indicated an external locus of control. Participants' responses reflected the belief that their weight difficulties and inability to achieve to EWL was due to factors outside of their control, and that the surgery would resolve their weight difficulties. In contrast, previous findings have indicated that those with an internal locus of control generally showed more positive health behaviours and were more successful in achieving their initial weight loss goals than program completers with similar values who had an external locus of control (Lefcourt, 2014). Surprisingly, external locus of control was not significant in predicting those on a lower weight loss trajectory in Study 3. This null finding may be due the timing of the questionnaires in that they were administered at 4 weeks to 6 weeks post-surgery. In contrast, the average time lapsed since the failed LAGB was 4 and 5 years, respectively, in the qualitative studies. In comparison, the quantitative study time frame was 6 months post-initial surgery and, thus, these patients were in the early stages post-bariatric surgery and would not be identified as not achieving EWL until post-24 months. Further, selective recruitment may have contributed to the different findings across the studies, as the participants from Studies 1 and 2 had all experienced failure to achieve EWL and the participants

in Study 3 included both potential successful and unsuccessful participants. Thus, the primary LSG cohort had not experienced failure in contrast to the revisional and multiple revisional cohorts' repeated experience of failure in their weight loss trajectory. Therefore, the timeframe since surgery and the experience of repeated failure may have contributed to patients' locus of control being non- significant in predicting % EWL in the early weight loss trajectory of the LSG.

A recent study has found that in the relationship between locus of control and adherence to a diabetes regimen, the internal locus of control increased by education level. A difference identified in the demographics of the participants in this program of research is their level of education. A majority of the participants in the qualitative studies reported having a secondary education and, in contrast, a majority of the participants in quantitative studies, a tertiary education. Thus, participants' level of education may have contributed to their understanding of the lifestyle and behavioural changes required post-surgery. Therefore, the higher level of education of the participants in the quantitative studies may have contributed to patients' locus of control, being non significant in predicting % EWL in the early weight loss trajectory of the LSG. Additionally, the patient's perception of the surgical procedure may have contributed to patients' locus of control, being non significant in predicting % EWL in the early weight loss trajectory of the LSG, in that the LAGB is considered a reversible procedure and the LSG is not. Surgical interventions are perceived by patients on a continuum of severity, with LAGB the least invasive, then the LSG, and the RYGB. The RYGB is perceived as the most invasive and as a permanent surgical intervention.

9.3.2 The Bio-psychosocial Approach

Studies 1 and 2 lent support to the bio-psychosocial approach model in that weight loss is defended and the impact of the weight regulatory system on the weight loss and regain trajectory for patients undergoing revisional and multiple revisional bariatric surgeries is unknown. Thus, the failure to achieve the weight loss or the weight regain experienced by some patients after revisional and multiple revisional procedures may have a physiological basis and may not be only the consequence of the resumption of prior eating patterns, behaviours, food preferences and inactivity levels.

9.3.3 Restraint Theory

The program of research lent support to the restraint theory, "Which suggests that an over-reliance on cognitive control over eating, rather than physiological cues, may leave dieters vulnerable to overeating when these cognitive controls are disrupted by emotions or the intake of forbidden food" (Herman & Mack, 1975 p. 647-66). Further, restraint can be both qualitative in the (type of food) and quantitative (amount of food) that is eaten. Thus, a perpetuating cycle of behaviour of rebound eating in response to the restriction of foods both in quality and quantity in Studies 1 and 2 resulted in an increased consumption of specific high calorie dense foods because of the reward or the ability to consume them. Studies 1 and 2 lend support to the restraint theory in that maladaptive eating behaviours developed in response to the restrictive nature of the LAGB and to the restriction of the types of foods that could be consumed. Consequently, emotional eating was described by patients as being used in an attempt to ameliorate the feelings of deprivation and increased negative affect.

9.3.4 Addiction Model

The program of research lends support to the addiction model of obesity that has also been proposed in previous research as an explanation for obesity. Participants in the qualitative studies in this program of research reported an ongoing desire for certain high calorific foods and emotional eating in response to cravings was a significant construct in Study 3. In previous studies, responses to certain foods (those high in fat, salt and sugar) were found to be similar to responses to addictive substances insofar as they engaged brain systems and they resulted in behavioural adaptations comparable to those engaged in drug use (da Silva & da Costa Maia, 2012b).

9.3.5 Trauma

Participants in the qualitative Study 3 identified that traumatic experiences such as sexual abuse and other interpersonal traumas had an impact on the bariatric surgery outcomes. The qualitative study supports the notion that some researchers have postulated, that obesity can be regarded as an adaptive defense or a self-protecting mechanism (Ray et al., 2003; Wiederman et al., 1999). Providing further support for this theory, patients who had multiple revisional surgery perceived their

additional weight as protection from potential sexual advances (Steinig et al., 2012). Thus, the grounded theory model from Study 3 adds to these limited studies and suggests that the experience of an interpersonal trauma such as sexual abuse may impact on the weight loss and long-term weight maintenance trajectory of bariatric surgery patients.

In summary, the program of research has lent support to the notion that the development and maintenance of obesity is complex and that obesity is a multifactorial disease. It also supports the conclusion that post-bariatric surgery, for some patients, expected weight loss outcome is influenced by factors both psychological and physiological in nature. Further, this program of research adds to the literature explaining possible reasons why obesity is a chronic disease and, in particular, that surgical intervention does not bring about an expected weight loss and satisfactory outcome for all patients.

9.4 STRENGTHS, LIMITATIONS AND FUTURE RESEARCH

This section focuses on the overall strengths and limitations of the program of research in general as the individual strengths and limitations of each paper has been discussed in their respective discussions. Overall, the program has significant strengths but also has some limitations. This research employed both quantitative and qualitative methods, and a range of data analysis techniques. The qualitative Studies 1 and 2 consisted of unstructured interviews and self-report measures and Study 3 participants reported their weight at 6 months post-surgery. Therefore, an important limitation of the program of research is the vulnerability of self-report measures as they may be open to bias. Thus, because the current program of research used self-reported data there may be possible threats to internal validity. For example, participants were requested to self report their weight at 6 months post-surgery in Study 3. Bias in participants' self-report of their current weight, for example, may occur for a variety of reasons, including embarrassment or shame which may compromise the overall validity of results, and thus their generalisability.

Study 3 utilised change in weight loss outcome as the dependent variable, as this was identified as important in the prior qualitative studies and is the primarily utilised outcome measure in the bariatric research literature. Bariatric patients generally experience improvement in quality of life post-surgery (Andersen et al.,

2010; Bocchieri et al., 2002a; Burgmer et al., 2007; Nguyen et al., 2006) and prior studies have found a strong positive correlation between the degree of improvement in quality of life and the degree of weight loss (Bult et al., 2008). However, weight loss outcome is just one outcome measure and future studies in primary, revisional and multiple revisional bariatric surgery patients should explore the role of changes to quality of life and health related quality of life post-bariatric surgery in association with weigh loss outcome post- bariatric surgery.

Although the current program of research explored a number of post-surgical eating behaviours in primary, revisional and multiple bariatric surgery populations, the scope of the research was limited to focus only emotional eating, loss of control eating, food cravings and taste changes. These constructs relating to maladaptive eating behaviours were identified as important in the prior qualitative studies. Thus, the findings of this program of research cannot generalise to bariatric surgery candidates with other eating behaviour difficulties or disorders such as anorexia nervosa, bulimia nervosa, binge eating disorder, night time eating syndrome and eating disorder not otherwise specified. Eating disorders exist on a spectrum of severity and the participants in this program of research may have experienced other maladaptive eating behaviours that were not identified or adequately captured by the chosen measures. Further, there may have been some pattern to participants' withdrawal from Study 3 after Time 1. It is possible that they may have been aware they were struggling to make lifestyle and behavioural changes and, in particular, changes to eating behaviours and the process of completing a second survey may have added to this struggle. If so, the results will not be able to reflect the experiences of those who are most at-risk following LSG.

The participants in the qualitative studies included a cohort of bariatric surgery patients who had undergone a primary bariatric LAGB, revisional and/or multiple revisional bariatric surgeries and had not achieved excess weight loss. This program of research did not interview those patients who achieved excess weight loss after a primary LAGB and it is not possible to determine if this population experienced the same constructs identified in the unsuccessful cohort of patients in the qualitative studies. Thus, the findings of the qualitative studies cannot be generalised to the primary bariatric surgery population.

The participants in the qualitative studies had failed to achieve EWL after a primary LAGB and had elected to have revisional and or multiple revisional bariatric surgery. Study 3 applied findings from Studies 1 and 2 to test the constructs identified in the causal model/s, aiming to identify the psychosocial factors that predict patients' early weight loss trajectories in a primary bariatric procedure. Further studies should examine the psychosocial presentation of bariatric patients who have been successful in achieving EWL in comparison to those patients who have failed to achieve EWL, after a primary procedure. It is a minority of bariatric patients who elect to have revisional surgery as revisional surgery is an expensive undertaking and comes with an increased risk of complications and a higher risk of morbidity and mortality. Examining a cohort of patients who have achieved EWL in comparison to those who have not achieved EWL following a primary bariatric procedure may assist in identifying specific problematic eating behaviours and potential differences in the psychosocial presentation that may negatively influence the weight loss trajectory. Consequently, examining these constructs in patients who had achieved EWL in comparison to those who had not achieved EWL after a primary bariatric procedure may provide further insights into the factors that contribute to unsuccessful EWL and could potentially be generalised to the primary bariatric surgery population.

The preliminary findings from study 3 are based on a bariatric patient cohort with a postoperative follow-up time of 6-8 months. This timeframe may be regarded as a limitation in light of findings that weight loss continues for up to 18-24 months' post-bariatric surgery. However, this postoperative time point is significant as the majority of the weight loss occurs in the first 6 months and identifying patients on a lower weight loss trajectory provides a unique opportunity for clinical intervention. Additionally, the 6 month time frame of follow up is noted as a consequence of recommendations from the American Society of Bariatric Surgeons that the findings from studies shorter than 24 months in length should be reported as "preliminary" (Sarwer, Lavery, & Spitzer, 2012). Further, this program of research strengthens and reinforces existing research in that it emphasizes that, as the bariatric post-surgery time increases, there is an increase in the number of patients who struggle with difficulties such as maladaptive eating behaviours that may impact on the weight loss trajectory.

The construct of interpersonal trauma was identified as an important construct in the qualitative Study 2, but was not investigated as a predictor variable in Study 3. The design of the study in that it was an online survey was not deemed appropriate given the sensitive nature of the construct. Thus, the models developed could not be fully tested in the quantitative study. Future research should investigate the impact of interpersonal trauma on the weight loss trajectory of primary and revisional and multiple revisional bariatric surgery patients. It may be appropriate to utilise a qualitative method as described in a recent study which examined the experiences of women who had experienced interpersonal trauma in their lives and had a long term positive psychological outcome (Srivastava, 2015). The grounded theory study was conducted using in depth interviews by suitable qualified researchers. The authors reported that care was taken to explain the objective and implications of the study and, once the participants agreed to participate in the study, they were given pseudonyms to protect their identities. Further, the results were shared and discussed and appropriate follow up psychological support was offered if required by participants (Srivastava, 2015).

Further, since the sample was mostly female across the program of research, the generalisability to male bariatric patients is limited, in particular to male patients presenting for multiple revisional bariatric surgery as all participants in Study 2 were female. Consequently, it would be helpful for future studies to include the experiences of male bariatric patients, as most studies, including this program of research, focus on the experiences of females. This finding as is important as, although more women currently elect to have bariatric surgery, it may change in the future, particularly as the rates of obesity are the same for both men and women. All the participants across the three studies were from the same geographical area and identified as being from the same ethnic group. The majority of the participants across the program had a secondary or tertiary level of education. Further, a majority of the participants in this program of research elected to have bariatric surgery in the private system which is representative of the bariatric surgery population, as people with private health insurance are nine times more likely than those without to have weight-loss surgery (Lukas et al., 2014). Therefore, since the sample was mostly patients in the private health system across the program of research, the generalisability to bariatric patients having surgery in the public system is limited, in

particular to public patients presenting for primary bariatric surgery. Consequently, it would be helpful for future studies to include the experiences of bariatric patients in the public system as there is an increased call for bariatric procedures to be performed in the public system in Australia.

The sample size in Study 3 was relatively small (N = 132) and the participants included in the study (N =106) all had a primary LSG. Although this sample is reflective of the LSG now being the most common bariatric procedure in Australia, in the prior qualitative studies all participants had a primary LAGB. As reported earlier, maladaptive eating behaviours in the qualitative studies may have developed as a consequence of the LAGB. Therefore, future qualitative studies should identify from a patient perspective, what contributed to not achieving EWL from a primary LSG procedure and led to them seeking revisional surgery.

The research literature on the psychosocial presentation of primary and revisional surgery and multiple revisional patients continues to progress and advance, and will presumably experience significant growth and development as the incidence of bariatric surgery and thus revisional surgeries increase. Additional research is needed to address the ways in which behavioural changes, in particular eating behaviours and food preferences, impact upon the weight loss trajectory in the bariatric surgery population. In order to provide empirical evidence of improved psychosocial outcomes for those patients who do have early effective intervention, future studies should examine patients' psychosocial presentation including changes in eating behaviour. It is of importance that longer-term studies be conducted with this vulnerable population and, in particular the newer LSG procedure to determine the long-term effectiveness of this procedure and bariatric surgery more generally.

9.5 CONCLUSION

The research program outlined in this thesis sought to systematically investigate the psychosocial presentation of bariatric surgery patients. Therefore, it has focussed on identifying the causes of weight loss failure for primary, revisional and multiple revisional bariatric surgery patients, by examining patients' psychosocial functioning and their perceptions of psychosocial factors that have contributed to these failures. The grounded theory models confirmed the importance of understanding revisional and multiple revisional bariatric surgery patients' needs

and vulnerabilities, and identified not only their unique psychosocial factors but combinations of factors, and, the increase in intensity of factors that explained these patients' repeated EWL failures. The model developed from Study 1 suggested three important psychosocial vulnerabilities that may be present in patients who had failed to achieve EWL and had revisional bariatric surgery: unrealistic expectations of LAGB, ongoing and increased consumption of high calorie dense as a primary coping strategy to cope with negative affect, and feelings of deprivation. The model developed in Study 2 suggested four important psychosocial vulnerabilities that may be present in patients who fail to achieve EWL and have multiple revisional bariatric surgeries: unrealistic expectations of weight loss surgery, historical interpersonal trauma, loss of control eating as primary coping strategy to cope with negative affect, and diminished enjoyment of food due to changes in taste and volume. Thus, the ensuing quantitative study examined these factors as predictors of postoperative weight loss in the short term for primary weight-loss surgery patients. This quantitative study provided clarification for differences in the early weight loss trajectory. This program of research extends current empirical understanding by identifying emotional eating as a response to food cravings as a risk factor for poor weight loss outcomes in primary LSG patients. Additionally, the results indicated that patient-reported outcomes such as subjective changes in taste, desire and enjoyment of flavours of the eight taste modalities are very common after LSG and that, in contrast to the findings of the qualitative studies, the primary LSG patients are generally satisfied with the quality of their alimentation.

The qualitative studies highlighted that the factors leading to an unsatisfactory weight loss outcome are multifactorial, complex and may be exacerbated or instigated by the type of bariatric surgery or as a consequence of the process of weight loss or weight loss failure. The findings of the quantitative studies supported this notion in that, as a consequence of LSG, there is an alteration to the taste, desire and enjoyment of flavours. The prior qualitative studies identified that bariatric surgery brought about changes in taste and a diminished satisfaction from eating. Thus, eating was no longer perceived as an effective coping strategy and the efficacy of the emotional eating to deal with and regulate negative emotional states was diminished. Thus, eating in response to emotional cues following bariatric surgery

represents an important area of clinical attention and may offer an indication that intervention is required.

Bariatric surgery is mostly an effective intervention for obesity. However, there remains a number of patients who don't achieve a satisfactory outcome. For these patients, the loss of quality of life is overwhelming. In addition, there remains the possibility that a number of patients who don't achieve a satisfactory outcome do not seek revisional procedures and so are not contributing to the assessment of the success of bariatric surgical procedures. Screening for the factors identified in this program of research and identifying those patients who may be vulnerable allows the opportunity to provide intervention that may alter their weight loss trajectory. Therefore, the results of the findings presented in this thesis have implications for patients, clinicians and health care professionals. Obesity rates continue to rise and, consequently, the incidence of bariatric surgery and revisional surgery is increasing. The program of research carried out in this thesis provides valuable information for early identification of at-risk patients. It also offers guidance for the types of interventions that may be useful for at-risk patients and provides direction for future research.

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Appendix A: Demographics Questionnaire

Participant Information Questionnaire

Psychosocial presentation of revisional laparoscopic gastric band surgery patients

All comments and responses are anonymous and will be treated confidentially.
The names of individual persons are not required in any of the responses.

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1 **Age**: _____

2 **Gender**:
□ Male
□ Female

3 **Cultural background identified with**:
_____

4 **Relationship status**:
□ Single
□ Married
□ de Facto
□ Divorced/separated

5 **Highest Level of Education Attained (for you):**
□ Primary School
□ High School
□ TAFE
□ University Postgraduate
□ University Undergraduate

6 **Are you currently working?**
□ Yes
□ No

7 **Occupation**:
_____

8 **Type of Employment:**
□ Part-time
□ Full time
□ Casual

9 **Number of hours worked per week:** _____

Appendix B :Obesity Psychosocial State Questionnaire (OPSQ)

Junilla Larsen & Geenen Rinie

Utrecht University, Department of Health Psychology, 2000

Instructions

People may have different expectations about what they hope to accomplish by undergoing treatment for obesity. **What do you expect to accomplish through this treatment?**

Of the following statements please indicate to what extent they apply to you by placing a cross in the box that best applies. The task is always to what extent the statements applied to you during the past two months and to what extent you expect that the statements will apply to you in about a year.

	During the past two months	**What do you expect to achieve approximately one year post treatment**
1. Walked long distances.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
2. Had much energy.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
3. Felt fat if someone took a photograph of you.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
4. Felt attractive.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
5. Had your eating habits under control.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always

	During the past two months	What do you expect to achieve approximately one year post treatment
6. Had pain.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
7. Felt tired.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
8. Felt hopeless.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
9. Made contact easily with other people.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
10. Valued yourself less than other people.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
11. Felt sad.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
12. Climbed stairs well.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
13. Had difficulty doing your work.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
14. Discriminated against due to your weight.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
15. Felt fat if you wore tight clothes.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always

		During the past two months	What do you expect to achieve approximately one year post treatment
16.	Felt satisfied with yourself.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
17.	Felt a burden on your joints.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
18.	Have problems with sex because of your weight.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
19.	Felt happy.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
20.	Feel helpless with regards to your eating behaviour.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
21.	Are disappointed in yourself.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
22.	Are often alone.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
23.	Have pain in your bones.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
24.	Felt fit.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
25.	Have good health.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always

		During the past two months	What do you expect to achieve approximately one year post treatment
26.	Find yourself attractive.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
27.	Have negative comments about your weight.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
28.	Rather be dead.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
29.	Can resist much work.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
30.	Feel fat if you eat sweets.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
31.	Feel proud of yourself.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
32.	Can control your eating behaviour.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
33.	You feel depressed.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
34.	Feel unattractive.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
35.	Can easily bend or kneel.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always

		During the past two months	What do you expect to achieve approximately one year post treatment
36.	Feel fat when strangers look at you.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
37.	Visit friends and acquaintances.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
38.	Have difficulty with intimacy because of your weight.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
39.	Shouted at on the street because of your weight.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
40.	Are intimate with someone.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
41.	Think you would rather die than be overweight.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
42.	Can do your work with no difficulty.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
43.	Notice that people are talking about you.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
44.	Be cuddled.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always
45.	Feel unhealthy.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always

	During the past two months	What do you expect to achieve approximately one year post treatment
46. Experience pain in your back.	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always	❑ Never ❑ Seldom ❑ Sometime ❑ Often ❑ Always

Appendix C: Depression and Anxiety and Stress scale (DASS 21)

Instructions

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you *over the past week*. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Did not apply to me at all

1 Applied to me to some degree, or some of the time

2 Applied to me to a considerable degree, or a good part of time

3 Applied to me very much, or most of the time

1	I found it hard to wind down	0 1 2 3
2	I was aware of dryness of my mouth	0 1 2 3
3	I couldn't seem to experience any positive feeling at all	0 1 2 3
4	I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion)	0 1 2 3
5	I found it difficult to work up the initiative to do things	0 1 2 3
6	I tended to over-react to situations	0 1 2 3
7	I experienced trembling (e.g., in the hands)	0 1 2 3
8	I felt that I was using a lot of nervous energy	0 1 2 3
9	I was worried about situations in which I might panic and make a fool of myself	0 1 2 3
10	I felt that I had nothing to look forward to	0 1 2 3
11	I found myself getting agitated	0 1 2 3

12	I found it difficult to relax	0	1	2	3
13	I felt down-hearted and blue	0	1	2	3
14	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15	I felt I was close to panic	0	1	2	3
16	I was unable to become enthusiastic about anything	0	1	2	3
17	I felt I wasn't worth much as a person	0	1	2	3
18	I felt that I was rather touchy	0	1	2	3
19	I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat)	0	1	2	3
20	I felt scared without any good reason	0	1	2	3
21	I felt that life was meaningless	0	1	2	3

Appendix D: Semi structured interview questions (Preliminary questions for the semi-structured interview)

Study One

1. What led you to be thinking about revisional surgery?
2. What do you think were the factors that contributed to your first procedure being unsuccessful?
3. How has the lack of success with the first procedure affected you emotionally?
4. What is your current relationship with food?
5. What kind of challenges are you facing?

Study Two

1. What has been the outcome of the revisional surgery for you?
    a. How has the surgery affected your eating?
    b. What about your self esteem?
    c. Tell me about your social life and relationships?
    d. What are your activity levels?
2. What are the factors that have influenced this outcome?
3. What kind of challenges are you facing?

Appendix E: Baecke Physical Activity Questionnaire

		Coding				
1) What is your main occupation?						
.....		*1*		*3*		*5*
2) At work I sit…						
never / seldom / sometimes / often / always	.....	*1*	*2*	*3*	*4*	*5*
3) At work I stand…						
never / seldom / sometimes / often / always	.....	*1*	*2*	*3*	*4*	*5*
4) At work I walk…						
never / seldom / sometimes / often / always	.....	*1*	*2*	*3*	*4*	*5*
5) At work I lift heavy loads…						
never / seldom / sometimes / often / very often	.....	*1*	*2*	*3*	*4*	*5*
6) After working I am tired…						
Very often / often / sometimes / seldom / never	.....	*5*	*4*	*3*	*2*	*1*
7) At work I sweat…						
Very often / often / sometimes / seldom / never		*5*	*4*	*3*	*2*	*1*
8) In comparison with others of my own age I think my work is physically…						
much heavier / heavier / as heavy / lighter / much lighter		*5*	*4*	*3*	*2*	*1*
9) Do you play sport?	Yes / No					
If yes…						
- which sport do you play most frequently						
.....		*0.76*		*1.26*		*1.76*
- how many hours a week?	<1 / 1-2 / 2-3 / 3-4 / >4	*0.5*	*1.5*	*2.5*	*3.5*	*4.5*
- how many months a year	<1 / 1-3 / 4-6 / 7-9 / >9	*0.04*	*0.17*	*0.42*	*0.67*	*0.92*
If you play a second sport…						
- which sport is it?						
.....		*0.76*		*1.26*		*1.76*
- how many hours a week?	<1 / 1-2 / 2-3 / 3-4 / >4	*0.5*	*1.5*	*2.5*	*3.5*	*4.5*
- how many months a year	<1 / 1-3 / 4-6 / 7-9 / >9	*0.04*	*0.17*	*0.42*	*0.67*	*0.92*
10) In comparison with others of my own age I think my physical activity during leisure time is…						
much more / more / the same / less / much less	.....	*5*	*4*	*3*	*2*	*1*
11) During leisure time I sweat…						
Very often / often / sometimes / seldom / never	.....	*5*	*4*	*3*	*2*	*1*
12) During leisure time I play sport…						
never / seldom / sometimes / often / very often	.....	*1*	*2*	*3*	*4*	*5*
13) During leisure time I watch television…						
never / seldom / sometimes / often / very often	.....	*1*	*2*	*3*	*4*	*5*
14) During leisure time I walk…						
never / seldom / sometimes / often / very often	.....	*1*	*2*	*3*	*4*	*5*
15) During leisure time I cycle…						
never / seldom / sometimes / often / very often		*1*	*2*	*3*	*4*	*5*
16) How many minutes do you walk and/or cycle per day to and from work, school and shopping?						
<5 / 5-15 / 15-30 / 30-45 / >45		*1*	*2*	*3*	*4*	*5*

Appendix F:The Three-Factor Eating Questionnaire—Revised 18-Item

1. When I smell a sizzling steak or juicy piece of meat, I find it very difficult to keep from eating, even if I have just finished a meal. Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
2. I deliberately take small helpings as a means of controlling my weight. Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
3. When I feel anxious, I find myself eating. Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
4. Sometimes when I start eating, I just can't seem to stop. Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
5. Being with someone who is eating often makes me hungry enough to eat also. Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
6. When I feel blue, I often overeat. Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
7. When I see a real delicacy, I often get so hungry that I have to eat right away. Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
8. I get so hungry that my stomach often seems like a bottomless pit. Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
9. I am always hungry so it is hard for me to stop eating before I finish the food on my plate. Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
10. When I feel lonely, I console myself by eating. Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)

11. I consciously hold back at meals in order not to weight gain. Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
12. I do not eat some foods because they make me fat. Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
13. I am always hungry enough to eat at any time. Definitely true (4)/ mostly true (3)/ mostly false (2)/ definitely false (1)
14. How often do you feel hungry? Only at meal times (1)/ sometimes between meals (2)/ often between meals (3)/ almost always (4)
15. How frequently do you avoid "stocking up" on tempting foods? Almost never (1)/ seldom (2)/ usually (3)/ almost always (4)
16. How likely are you to consciously eat less than you want? Unlikely (1)/ slightly likely (2)/ moderately likely (3)/ very likely (4)
17. Do you go on eating binges though you are not hungry? Never (1)/ rarely (2)/ sometimes (3)/ at least once a week (4)
18. On a scale of 1 to 8, where 1 means no restraint in eating (eating whatever you want, whenever you want it) and 8 means total restraint (constantly limiting food intake and never "giving in"), what number would you give yourself? The 1–2 scores were coded 1; 3–4 scores were coded 2; 5–6 scores were coded 3; 7–8 scores were coded 4.

The cognitive restraint scale was composed of items 2, 11, 12, 15, 16, and 18. The uncontrolled eating scale was composed of items 1, 4, 5, 7, 8, 9, 13, 14, and 17. The emotional eating scale was composed of items 3, 6, and 10

Appendix G : Internal versus External of Control of Weight

Table 1
Scale of Internal Versus External Control of Weight

Item
Overweight problems are mainly a result of hereditary or physiological factors.[a] Overweight problems are mainly a result of lack of self-control.
Overweight people will lose weight only when they can generate enough internal motivation. Overweight people need some tangible external motivation in order to reduce.[a]
Diet pills can be a valuable aid in weight reduction.[a] A person who loses weight with diet pills will gain the weight back eventually.
In overweight people, hunger is caused by the expectation of being hungry. In overweight people, hunger is caused by stomach contractions and low blood sugar levels.[a]
Overweight problems can be traced to early childhood and are very resistant to change.[a] Overweight problems can be traced to poor eating habits which are relatively simple to change.

Note. Subjects were instructed as follows: "Each item consists of two statements; choose the statement with which you *agree most.*"
[a] External response.

Appendix H: The Mental Health Inventory -5 (MHI-5)

The Mental Health Inventory - 5 (MHI-5)

Instructions:

Please read each question and tick the box by the **ONE** statement that best describes how things have been FOR YOU during the past month.

There are no right or wrong answers.

1. **During the past month, how much of the time were you a happy person?**

All of the time	Some of the time
Most of the time	A little of the time
A good bit of the time	None of the time

2. **How much of the time, during the past month, have you felt calm and peaceful?**

All of the time	Some of the time
Most of the time	A little of the time
A good bit of the time	None of the time

3. **How much of the time, during the past month, have you been a very nervous person?**

All of the time	Some of the time
Most of the time	A little of the time
A good bit of the time	None of the time

4. **How much of the time, during the past month, have you felt downhearted and blue?**

All of the time	Some of the time
Most of the time	A little of the time
A good bit of the time	None of the time

5. **How much of the time, during the past month, have you felt so down in the dumps that nothing could cheer you up?**

All of the time	Some of the time
Most of the time	A little of the time
A good bit of the time	None of the time

Appendix I: Taste Desire and Enjoyment Change Questionnaire (TDECQ)

Taste Changes Questionnaire (TCQ)

The questions below relate to the extent your tastes and desires for certain foods or liquids have changed or stayed the same since undergoing bariatric surgery. Please circle the number that best represents the extent of any changes in taste and the extent of change of desires/cravings for certain foods or liquids. *(foods refers to all types of foods and liquids)

The rating scale is as follows:

1- Much weaker flavor/taste
2- Weaker flavor/taste
3- No change in strength of flavor/taste
4- Stronger flavor /taste
5- Much stronger flavor/taste

1. I noticed that the taste of salty foods has changed	1	2	3	4	5
2. I noticed that the of taste of sugar /sweet foods has changed	1	2	3	4	5
3. I noticed that the taste of fatty/oily foods has changed	1	2	3	4	5
4. I noticed that the taste of sour/tart foods has changed	1	2	3	4	5
5. I noticed that the taste of savory foods has changed	1	2	3	4	5
6. I noticed that the taste of spicy or piquant foods has changed	1	2	3	4	5
7. I noticed that the taste of bitter foods has changed	1	2	3	4	5
8. I noticed that foods and liquids have a metallic taste	1	2	3	4	5

The rating scale is as follows:

1- Much weaker desire/enjoyment
2- Weaker desire/enjoyment
3- No change in desire/enjoyment
4- Stronger desire/enjoyment
5- Much stronger desire/enjoyment

9. I noticed that the desire for salty foods has changed	1	2	3	4	5

10. I noticed that the desire for sugar/sweet foods has changed	1	2	3	4	5
11. I noticed that the desire for fatty/oily foods has changed	1	2	3	4	5
12. I noticed that the desire for sour/tart foods has changed	1	2	3	4	5
13. I noticed that the desire for spicy/piquant foods has changed	1	2	3	4	5
14. I noticed that the desire for bitter foods has changed	1	2	3	4	5
15. I noticed that the desire for metallic tasting foods has changed	1	2	3	4	5
16. I noticed that the desire for savory foods has changed	1	2	3	4	5
17. I noticed that the enjoyment of salty foods has changed	1	2	3	4	5
18. I noticed that the enjoyment of sweet foods has changed	1	2	3	4	5
19. I noticed that the enjoyment of fatty /oily foods has changed	1	2	3	4	5
20. I noticed that the enjoyment of sour/tart foods has changed	1	2	3	4	5
21. I noticed that the enjoyment of spicy/piquant foods has changed	1	2	3	4	5
22. I noticed that the enjoyment of bitter foods has changed	1	2	3	4	5
23. I noticed that the enjoyment of savory foods has changed	1	2	3	4	5
24. I noticed that the enjoyment of metallic tasting foods has changed	1	2	3	4	5

Appendix J: Food Cravings Questionnaire-trait (FCQ-T)

Table 2
Factors, factor loadings, items, and item loadings (standardized) for the FCQ-T (n= 109)

Having intentions and plans to consume food	
5. Food cravings invariably make me think of ways to get what I want to eat.	
18. Whenever I have cravings, I find myself making plans to eat.	
23. When I crave certain foods, I usually try to eat them as soon as I can.	
Anticipation of positive reinforcement that may result from eating	
9. I eat to feel better.	
10. Sometimes, eating makes things seem just perfect.	
15. Eating what I crave makes me feel better.	
24. When I eat what I crave I feel great.	
38. When I eat food, I feel comforted.	
16. When I satisfy a craving, I feel less depressed.	
19. Eating calms me down.	
21. I feel less anxious after I eat.	
Lack of control over eating	
2. When I crave something, I know I won't be able to stop eating once I start.	
3. If I eat when I am craving, I often lose control and eat too much.	
22. If I get what I am craving, I cannot stop myself from eating it.	
25. I have no will power to resist my food crave.	
26. Once I start eating, I have trouble stopping.	
29. If I give in to a food craving, all control is lost.	
Thoughts or preoccupation with food	
6. I feel like I have food on my mind all the time.	
8. I find myself preoccupied with food.	
27. I can't stop thinking about eating no matter how hard I try.	
28. I spend a lot of time thinking about whatever it is I will eat next.	
31. I daydream about food.	
32. Whenever I have a food craving, I keep on thinking about eating until I actually eat the food.	
33. If I am craving something, thoughts of eating it consume me.	
Craving as a physiological state	
11. Thinking about my favorite foods makes my mouth water.	
12. I crave foods when my stomach is empty.	
13. I feel as if my body asks me for certain foods.	
14. I get so hungry that my stomach seems like a bottomless pit.	
Emotions that may be experienced before or during food cravings or eating	
20. I crave foods when I feel bored, angry, or sad.	
30. When I'm stressed out, I crave food.	
34. My emotions often make me want to eat.	
39. I crave foods when I'm upset.	
Cues that may trigger food cravings	
1. Being with someone who is eating often makes me hungry.	
35. Whenever I go to a buffet, I end up eating more than what I needed.	
36. It is hard for me to resist the temptation to eat appetizing foods that are in my reach.	
37. When I am with someone who is overeating, I usually overeat too.	
Guilt from cravings and/or for giving into them	
4. I hate it when I give in to cravings.	
7. I often feel guilty for craving certain foods.	
17. When I eat what I am craving, I feel guilty about myself.	

Appendix K: Quality of Alimentation Questionnaire

Suter et al

Appendix 1.

QUALITY OF ALIMENTATION

Name: _____ Surname: _____ Months after Surgery: _____ months

How would you rate your overall satisfaction regarding how you can eat presently?

- Excellent ☐
- Good ☐
- Acceptable ☐
- Poor ☐
- Very Poor ☐

Why?

_____
_____
_____
_____

How many meals do you eat a day? _____
Among the following meals, which one do you have?

- Breakfast ☐
- Lunch ☐
- Supper ☐

Which of them constitutes your daily main meal? _____

Do you eat between meals?

- Yes ☐
- No ☐

If yes, when?

- Morning ☐
- Afternoon ☐
- Evening ☐

Can you eat everything?

- Yes ☐
- No ☐

More specifically, how can you eat?

	Easily	With some difficulties	Not at all
Red meat	☐	☐	☐
White meat	☐	☐	☐
Salad	☐	☐	☐
Vegetables	☐	☐	☐
Bread	☐	☐	☐
Rice	☐	☐	☐
Pasta	☐	☐	☐
Fish	☐	☐	☐

Are there other types of food that you cannot eat at all? _____
_____
_____

Do you vomit/regurgitate? ☐ Daily ☐ Often (> 2x/week) ☐ Rarely ☐ Never

Appendix L: Example of Grounded Theory Coding

Example of the illustration of the analysis of the line-by-line coding in the left-hand column against the extracts from transcribed interviews in the right-hand column from Study 1.

Line-by-line coding	**Extract from Interview**
Using food as a comfort	"I guess for me, food was my comfort, to help me through many difficulties"
Feeling shame in response to experiencing failure.	"I was so ashamed and I just thought, I can't do it on my own, obviously, I've tried and tried"
Experiencing loneliness in social interactions.	"In such a dark place, so you don't want to go out [with friends]"
Lack of social life in response to eating with LAGB	"So then we ended up not having much social life, we didn't spend as much time with friends."
Food choices in response to restriction of LAGB	"Because I couldn't eat proper food I ate the foods that could go through easily"
Change in food choices as a consequence of restriction of LAGB	"Then I would just turn to the good old ice cream [comfort food] because I couldn't eat a normal meal"
Increase in the choices of high calorific foods	"I just ate more crap foods like ice cream and chocolate milk"
Expectations of LAGB surgery	"I thought the band would, just solve everything"

In the open coding process, the interviews were analysed line by line initially, and then larger paragraphs were coded in order to identify, name, categorize and describe the phenomena found in the data. The following questions are examples of the questions that were asked of the data in this coding process, "What is this about?", "What is happening here?", and "What is being referenced here?"

Appendix M: Examples of coding process from Study 1, including Axial coding and Selective coding

Selective Category: Restriction of LAGB: increased consumption of high calorific foods or fluids because of the texture or reward

↑

Axial coding

(Related codes were grouped into categories and relationships between these categories were examined utilising axial coding)

Increased consumption of high calorific foods or fluids because of the texture or reward:

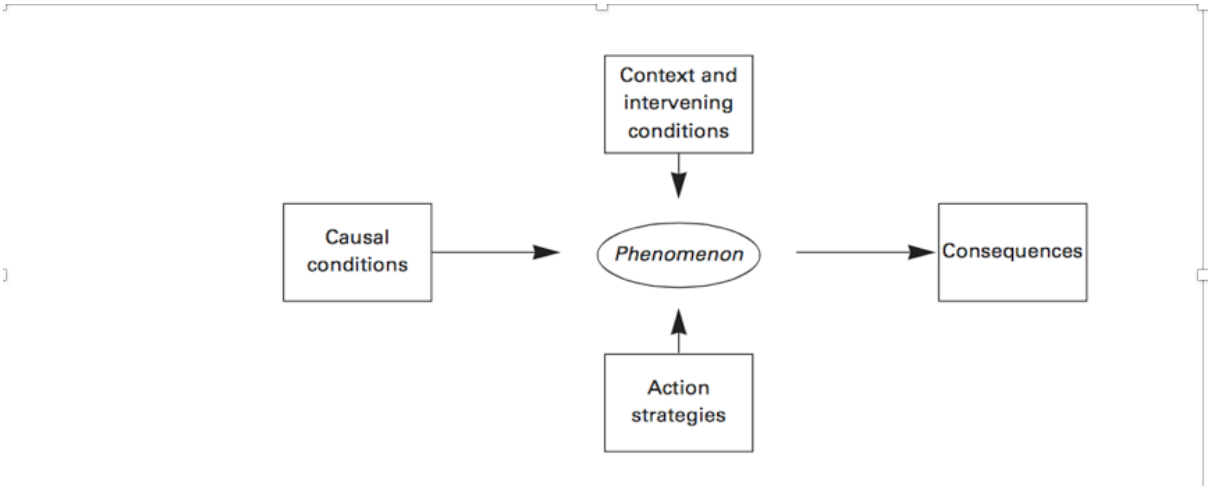
- Increases the desire for reward from choices
- Leads to increased in weight/Not achieving EWL
- Impacts Shame and loneliness
- Restriction of LAGB

↑

Codes

- Positive and negative food choices
- Positive and negative emotions experiences as a consequence of the LAGB
- Negative physical experiences
- Changes in choices of food and beverages
- Inability to feel satiety
- Desire for food
- Restriction of LAGB
- Expectations of LAGB

Example of the coding process including Axial coding leading to the Selective category "Increased consumption of high calorific foods or fluids because of the texture or reward." *Related codes were grouped into categories and relationships between these categories were examined utilising axial coding*



Axial Coding Paradigm (Corbin & Strauss, 2008).

Strauss's coding paradigm (Corbin & Strauss, 2008), as illustrated in the above figure was utilised in the axial coding process. Axial coding was used to reassemble the data after open coding and examine the relationships between the categories. The following example with quotes from Study 1 illustrates this process where, "increased consumption of high caloric foods because of texture or reward" is the phenomenon. The causal conditions in the example below, are both the restriction that is experienced as a consequence of the LAGB, and the limitation on of the amount of and types of food that are able to be eaten and drunk with the LAGB.

> *"I got to the stage where nothing would go down, I could just eat ice cream and everything else naughty as in chocolate because it would go through and it never got stuck. The minute you'd sit down to eating a meal of meat and vegetables, you would feel the restriction. Then I would just turn to the good old ice cream [comfort food] because I couldn't eat a normal meal" (Participant 19)*

The context and intervening conditions are the variability in the restriction of the LAGB, in that the medical professional can adjust the diameter of the LAGB by inserting fill and therein increase the restriction to reduce the quantity of foods consumed in a period of time, in an attempt to achieve weight loss, maintain weight loss or address weight regain.

"The weight came back and I just found that it wouldn't matter how much the doctor tightened it up, I can always find ways around to satisfying my hunger" (Participant 4)

The action strategies in this example are, that patients changed the choices of the texture and types of foods consumed and altered their eating and drinking behaviours in response to the restriction (intervening condition) and increased consumption of high caloric foods and fluids because of texture or reward (phenomenon).

"The easiest foods to eat were the ones that weren't good for me like chips, chocolate, ice cream. I probably lost maybe four or five kilos in my first week on liquids. That's where I lost the majority of my weight, I was just not really eating the right stuff afterwards, because I couldn't eat proper food I ate the foods that could go through easily. I felt like I failed from the start" (Participant 4)

The intended and unintentional consequences of these action strategies of the participants changing their food choices in response to the restriction of the LAGB to high calorie dense soft foods to obtain relief from negative feelings (failure) and ultimately not achieving or maintaining weight loss outcome, and therefore, resulting in revisional bariatric surgery.

Appendix N: Example of Memo

Expectations of LAGB

"I entered into it thinking it was going to be a quick fix. I wasn't prepared to do the hard yards to make it work. So then I just didn't put any effort into it. I thought the band would, just solve everything." (Participant 2 reported everything to be: Health problems, weight, social and relationship difficulties and desire for high calorie dense foods)

In response to this interview, the memo written up read:

When recounting the initial decision to undergo LAGB surgery this person placed significant expectations on the LAGB surgery itself, to address long-term difficulties in both social and health domains and limit the desire for high calorie dense foods. In the interview the participant reported that he had struggled with high blood pressure and diabetes and had a long term battle with weight. The participant reported eating ice cream and high fat foods such as hot chips and drinking coke with the LAGB. Health issues have not prompted changes in eating behaviours and choices. Relationship difficulties attributed to weight. The participant appears to have had embarked on this weight loss journey without really understanding or accepting the lifestyle and behavioural changes required to bring about weight loss with the LAGB and that the surgery is just an aid. The participant had expectations that the LAGB itself would bring about these changes in eating behaviours and bring about positive change in romantic relationships. Participant has not had realistic expectations of what his role in the weight loss process is. This belief in surgery as the only satisfactory solution to these difficulties and diminished responsibility suggests an external locus of control (Rotters locus of control theory).

Unrealistic expectations through the process of selective coding was identified as the core category.