A Dissertation

titled

Factors Predicting Weight Loss in Females After Gastric Bypass Surgery

by

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Obesity has become an epidemic in the United States, especially in the past 30 years, with the rate of obesity more than doubling. Bariatric surgery has become a more common method to deal with obesity and its associated sequelae. Before being approved for surgery, one must engage in a psychological evaluation to determine whether one has the psychological and emotional resources necessary to proceed with gastric bypass surgery. The objective of the current study was to determine whether specific psychological variables obtained during the psychological evaluation for gastric bypass surgery, specifically, the validity and clinical scales of the MMPI-2 and the SCL-90-R, and psychological variables obtained during the clinical interview, could be used to predict success post-surgery in terms of percent excess weight lost (% EWL). It was expected that clinical elevations on these scales would predict lower weight loss. Results indicated that the only significant predictor of outcome, in terms of a higher %EWL, was a lower score on subscale Pd2 (Psychopathic Deviate: Authority Problems) of the MMPI-2 at six months post-surgery. However, higher scores on scale 2 (Depression) and F (Infrequency), as well as a greater number of Axis I diagnoses approached significance as predictors of %EWL at 6 months post-surgery. In addition, a greater number of self-
reported coping mechanisms and a higher score on scale 1 (Hypochondriasis) of the MMPI-2 also demonstrated a trend towards significance for being considered significant predictors at 1 and 2 years post-surgery, respectively. None of the hypothesized predictor variables were found to be significant predictors of %EWL at 3 months, 1 year, or 2 years post-surgery, or for maintenance of weight loss from 1 to 2 years post-surgery. Limitations, strategies to overcome these limitations, and directions for future research are discussed.
I dedicate my dissertation to my mom and dad, Nancy and Steve Zaleski. They have supported me throughout my life and believed in me when I had trouble believing in myself. Mom and Dad, this accomplishment is just as much yours as it is mine, and it would not have been possible without your love and understanding. Words alone cannot express how grateful I am for your support and encouragement.
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Chapter 1

Introduction

Obesity has become an epidemic in the United States, as well as other countries, especially in the past 30 years. As a result, weight-loss surgery has become increasingly popular as a way to combat the negative effects of obesity (e.g., diabetes, sleep apnea, hypertension, etc.). Those who would like to have weight-loss surgery typically need to be psychologically evaluated to determine whether they have the resources needed to cope with a surgery of that nature. Some guidelines have been established to determine that an individual would not be an appropriate candidate for surgery; however, little research has examined what characteristics actually predict post-surgery success. One measure some insurance companies (e.g., Blue Cross Blue Shield, Pre-Bariatric Surgery Evaluation Tool, 2009) require to be administered during the pre-operative psychological evaluation is the Minnesota Multiphasic Personality Inventory, 2nd Edition (MMPI-2; Hathaway & McKinley, 1989). The current study explored the utility of scores on various scales, including validity scales (i.e., F, L, K, S) and specific clinical scales (i.e., Hs, D, Hy, Pd1, Pd2, TRT1, and TRT2) in predicting post-surgery success in terms of percent excess weight lost (%EWL). This was done in order to determine whether evaluators could use this information in helping to decide if someone is a good candidate for surgery. Another question was whether or not this information could be used to
illuminate areas in need of management for the individual either before or after having the surgery in order to increase the chances of success.

The objective of the current study was to determine whether specific psychological variables obtained during the psychological evaluation for gastric bypass surgery could be used to predict success post-surgery in terms of percent excess weight lost (%EWL). Records were obtained from individuals’ pre-surgery psychological evaluation and prior and current weight history as indicated in their medical charts at follow-up visits. This information was analyzed to determine whether specific psychological variables would predict physical post-surgery success. This knowledge would allow for more effective individual recommendations to increase success rates for this invasive weight control method.
Chapter 2

Review of the Literature

Obesity

Obesity has become an epidemic in the United States (U.S.), as well as other countries, especially in the past 30 years. According to the National Health and Nutrition Examination Survey (NHANES), the percentage of obese adults has increased from 15% in the 1976-1980 survey to 32.9% in the 2003-2004 survey (CDC, 2008). A typical measure for body weight is the body mass index, or BMI. BMI is a measure of body weight, which takes one’s height into account and is measured in kg/m\(^2\). One is considered to be overweight with a BMI \(\geq 25\) kg/m\(^2\); obese with a BMI \(\geq 30\) kg/m\(^2\); and morbidly obese with a BMI \(\geq 40\) kg/m\(^2\) (CDC). Overall, the estimated current prevalence of people considered to be overweight or obese in the U.S. is 66 percent. Causes for this problem are typically reported as being a lack of physical activity and excess calorie consumption (CDC). Also, as a society, we have become more and more dependent upon the abundance of convenience. With an average of four fast food restaurants per square mile (Spurlock, 2004), it is much easier and sometimes less expensive to buy fast food than to eat a healthy meal at home. Additionally, people get less exercise in everyday life as a result of technology such as phones, email, and cars (Obesity in America). Some studies report that other life experiences, such as childhood maltreatment (Grilo, Masheb, Brody, Toth, Burke-Martindale, & Rothschild, 2005) and food insecurity, or “not having
access at all times to enough food for an active, healthy lifestyle because food products are not consistently available or households are not consistently able to afford such food products” (Martin & Ferris, 2007, p. 31) during childhood (Adams, Grummer-Strawn, & Chavez, 2003; Townsend, Peerson, Love, Achterberg, & Murphy, 2001), increase the chances of becoming an obese adult. Regardless of the cause, there is increasing recognition of the need to address and ameliorate the often devastating consequences of obesity, as these are so prevalent in our society.

Consequences of Obesity

Obesity has many serious outcomes. Physical consequences can include heart disease, hypertension, hypercholesterolemia, and sleep apnea (Snethen & Broome, 2007); as well as orthopedic complications and polycystic ovary syndrome (Howard, 2007). Psychological difficulties resulting from overweight or obesity include outcomes such as low self-esteem (Hesketh, Wake, & Waters, 2004), adjustment problems, social stigma, and negative social relationships (Snethen & Broome, 2007). Social and occupational functioning can also be affected in terms of decreased work productivity, increased health care costs, disability, and premature death (Martin & Ferris, 2007). In fact, obesity is the second leading preventable cause of death in the United States, with some speculation that it would replace smoking cigarettes as the first leading cause as early as 2010 (Mokdad, Marks, Stroup, & Gerberding, 2004; Stein & Colditz, 2004), although current statistics are not yet available.

Psychological Profile of Obese Individuals

It remains debatable whether obese individuals have a different psychological profile than their average-weight peers. Due to the possible social consequences of
obesity (e.g., discrimination, lowered self-esteem), it has been hypothesized that obese individuals may present with more symptoms such as anxiety or depression. In a review conducted by Greenberg, Perna, Kaplan, & Sullivan (2005), 198 abstracts from studies examining weight loss surgery candidates were obtained, leading to a detailed review of 17 papers. Overall, they discovered a high incidence of depression, negative body image, eating disorders, low self-esteem, and low quality of life (QOL) in severely obese patients. Further, anxiety and depression were three to four times more prevalent in obese individuals than their “leaner peers” (p. 244).

In a psychosocial assessment of 221 bariatric surgery candidates, Dymek-Valentine, Rienecke-Hoste, & Engelberg (2005) concluded that these individuals demonstrated a mild to moderate clinically significant level of depression, as measured by the Beck Depression Inventory, 2nd Edition ($M = 17.1, SD = 9.5$; BDI-II; Beck, Steer, & Brown, 1996;) and slightly lower than average self-esteem than a non-clinical population, as measured by the Rosenberg Self-Esteem Scale ($M = 28, SD = 6.1$; RSES; Rosenberg, 1965). In addition, patients rated weight and shape as being very important in determining self-esteem on a 4-point Likert scale (1 (not very important) to 4 (very important); $M = 3.1, SD = .9$). In terms of eating behaviors, surgery candidates demonstrated elevations on the Disinhibition ($M = 10.6, SD = 3.7$) and Hunger ($M = 8.1, SD = 3.5$) subscales of the Three-Factor Eating Questionnaire (TFEQ; Stunkard & Messick, 1985) as compared to a non-clinical female sample.

Other studies, however, have demonstrated that the psychological profiles of obese individuals are not significantly different than those of their peers (Stunkard, Stinnet, & Smoller, 1986). Based on a literature review, van Hout, van Oudheusden, &
van Heck (2004), suggested that the morbidly obese population is not homogeneous and actually has three separate subgroups: high functioning, poor functioning, and moderate functioning. One finding that does appear to be consistent, however, is that obese individuals seeking treatment experience poorer quality of life and greater psychological impairment than obese individuals not seeking treatment (Fitzgibbon, Stolley, & Kirschenbaum, 1993; Fontaine, Bartlett, & Barofsky, 2000; Kolotkin, Meter, & Williams, 2001).

In studies of bariatric surgery seekers, MMPI-2 profiles have demonstrated clinical elevations on specific scales, as compared to the normative population. Maddi, Khoshaba, Persico, Bleecker, & VanArsdall (1997) found that the typical profile had moderate elevations on scales 1 (Hypochondriasis), 2 (Depression), and 3 (Hysteria). These trends were mirrored, with additional clinical elevations, in studies conducted by Castellano (2004) and Greenbank (2006). In a study of 55 gastric bypass candidates, Castellano (2004) found evidence of clinical elevations on the following scales: L (Lie), F (Infrequency), 1 (Hypochondriasis), 2 (Depression), 3 (Hysteria), 4 (Psychopathic Deviate), 6 (Paranoia), and 7 (Psychasthenia). Greenbank (2006) examined the MMPI-2 profiles of 191 individuals seeking weight-loss surgery. Scores indicated a clinical elevation on the Health subscale for males, and Scales 1 (Hypochondriasis) and 3 (Hysteria) for females. Muhlans, Horbach, & de Zwaan (2009) found that 55.5% of German obese individuals seeking bariatric surgery met criteria for diagnosis of an Axis I disorder through use of the Structured Clinical Interview for the DSM-IV (SCID; First, Gibbon, & Spitzer, 1996). Thus, past research suggest that, although previous studies have found that, as a group, obese individuals do not demonstrate any more
psychological symptoms or disorders than their peers, it appears that those who seek surgical treatment for obesity are more psychologically distressed than obese individuals who do not seek treatment.

*Bariatric (Weight Loss) Surgery*

Weight-loss surgery has become increasingly popular as a way to combat the negative effects of obesity (Kral 1995; Sugerman, Shikora, & Schauer, 2007). Based on a review of the literature, Dymek-Valentine, Rienecke-Hoste, & Engelberg, (2005) stated “the available literature consistently shows that bariatric surgery is the most effective and lasting method of weight loss in the morbidly obese” (p. 23). Indicators for bariatric surgery, established by a National Institutes of Health Consensus Conference (1991), include patients with Class III obesity (i.e., BMI >40 kg/m$^2$); or those with Class II obesity (i.e., BMI 35.0–39.9 kg/m$^2$) and one or more severe obesity-related medical complications (e.g., hypertension, type II diabetes, sleep apnea) and an inability to sustain weight loss through non-surgical techniques.

Fox, Taylor, & Jones (2000) collected data from 395 obesity surgery patients through questionnaires sent to them post-surgery (out of 1200 surveys mailed). Demographically, the typical obese patient who had sought surgery was a 43-year-old European-American female who was 5’5” tall and weighed 291 lbs with a BMI of 48.4 kg/m$^2$. The average patient graduated from high school, was married, had 2.5 children, and was employed full-time earning between $28,000 and $75,000 per year.

There are several different types of bariatric surgery including Roux-en-Y gastric bypass, adjustable gastric banding, and biliopancreatic diversion (Klein & Sugerman, 2008). Gastric bypass is currently the most popular approach as a result of its safety and
long-term success (The Toledo Hospital Bariatric Program, “About the surgery,” 2007). Thus, the current study focused on a sample of individuals who had chosen to have bariatric surgery by a surgeon who utilizes only this technique.

Roux-en-Y gastric bypass surgery is both restrictive and malabsorptive in nature. This means that the stomach is reduced to a small pouch able to hold less than one ounce of food at a time (i.e., restrictive), while the small intestine is shortened, causing a reduction in the amount of nutrients absorbed by the body (i.e., malabsorptive). The clinic in the Midwest that was utilized for the current study reported that patients typically lose 75% of their excess weight in the first year after surgery and that 95% report an enhanced quality of life (The Toledo Hospital Bariatric Program, 2007).

**Definition of success.** The definition of success after a surgery of this nature varies (see Delin & Watts, 1997). Studies have examined both reduction in severity of psychological symptoms and various physiological measures. While it is important to improve quality of life and social, psychological, and occupational functioning among the obese seeking weight loss surgery, the main reason for seeking surgery is to lose excess weight (i.e., weight over and above the individual’s predetermined healthy weight, based on height, typically measured as a BMI between 18.5 and 24.9 kg/m$^2$). Suggestions for cut-off points for success post-surgery vary across studies between 50% and 75% EWL (Crookes, 2006; Gastric Bypass Outcomes, 2010; Klein & Sugerman, 2008; North Shore University Health System, 2010; Sogg & Mori, 2004; The Toledo Hospital Bariatric Program, 2007; Toussi, Fujioka, & Coleman, 2009; Tsushima, Bridenstine, & Balfour, 2004; Wadden, et al., 2001). Thus, the current study used % EWL, a continuous variable, as the criterion variable.
Risks of bariatric surgery. As is inherent in any surgery, bariatric surgery carries some physical, as well as psychological, risks. Risks include problems such as: pouch stretching or leakage, dumping syndrome (defined as a syndrome in which the stomach contents move too rapidly through the small intestine; ObesityHelp, 2008), wound infection, hernias, gallstones, blood clots, vitamin deficiencies and death (The Toledo Hospital Bariatric Program, “Benefits and risks,” 2007).

Those who participate in bariatric surgery may continue to have some of their preexisting psychological, social, and occupational difficulties and may also develop new and different difficulties in response to the changes brought about by surgery. For example, Jones-Corneille, Wadden, & Sarwer (2007) found that those with extreme obesity (i.e., BMI ≥ 40 kg/m^2) who sought bariatric surgery had higher rates of depression and suicidality than individuals who fell within a less obese category (i.e., BMI = 30.0 to 39.9 kg/m^2), especially if they had preoperative psychopathology or had unmet, unrealistic expectations regarding the life-transforming change resulting from surgery. Similarly, Kodama and colleagues (1998) found that depression and suicidal ideation may be experienced after bariatric surgery and patients can experience exacerbation of their pre-operative diagnosis of major depressive disorder. Further, Sarwer, Fabricatore, Jones-Corneille, Allison, Faulconbridge, & Wadden (2009) found that patients may experience negative postsurgical effects such as increased depression and suicide, suboptimal weight loss, malnutrition, gastrointestinal symptoms, body image dissatisfaction, and substance misuse.

Overall, surgical failure rates for bariatric surgery approximate 20% (Benotti & Forse, 1995) and not all patients benefit from the procedure (Clark, Balsiger, Sletten, et
Patients have to take care to make adjustments to their intake of vitamins and nutrients via supplements. Further, greater variability in the dissolution (i.e., the process of dissolving a solid substance into a solvent to yield a solution) of psychiatric medications in the body may occur, which would require adjusted dosing (Seaman, Bowers, Dixon, & Schindler, 2005). Overall, taking psychotropic medication to treat depression was not found to have an impact on patients’ weight loss after gastric bypass surgery (Love, Love, Bower, & Poston, 2008). In addition, Type II diabetes mellitus has been demonstrated to recur three years post-surgery for individuals who regained an average of 37.7% of their lost weight (DiGiorgi, Rosen, Choi, Milone, Schrope, Olivero-Rivera, et al., 2010). Most strikingly, a 7-year follow-up study found that individuals who had undergone gastric bypass surgery demonstrated a 58% increase in non-disease related deaths, such as accidents and suicide (Adams, Gress, Smith, Halverson, Simper, Rosamond, et al., 2007). Thus, although bariatric surgery is an available tool to assist in weight loss for obese individuals, it also carries a great risk of complications, both physical and psychological. This is further evidence that individuals need to be adequately screened for appropriateness prior to a surgery of this magnitude.

**Benefits of gastric bypass surgery.** Despite the risk involved, many patients do, in fact, experience significant physiological benefits from bariatric surgery (Mun, Blackburn, & Matthews, 2001). These benefits may include: significant weight loss, improvement in Type II diabetes, lowered blood pressure, reduced risk of heart disease, lowered cholesterol, an improvement in sleep quality (i.e., reduction in severity of sleep apnea), relief from specific obesity-related diseases such as gastro esophageal reflux disease (GERD) and various bodily pains, and improved mobility (The Toledo Hospital
Bariatric Program, “Benefits and risks,” 2007). It has been suggested that weight-loss surgery is the most effective therapy for diabetes mellitus (Grady, 2008; Pories, Swanson, MacDonald, et al., 1995). In a study conducted by Mitchell and colleagues (2001), the majority of individuals who had gastric bypass surgery believed that it benefited them, but did report some long-term difficulties in changing eating patterns. In addition, it has been reported that bariatric surgery results in an 89% reduction in risk of death over five years (Christou, 2004), and a 40% reduction in mortality in a 7-year follow-up study (Adams, et al., 2007).

Pre-Operative Psychological Evaluation

Because of the risk involved in any surgery, and the psychological and physical changes associated with a surgery of this nature, individuals must be evaluated by a psychologist to determine whether they are an appropriate candidate for bariatric surgery. Another important reason for a preoperative evaluation is to be able to identify patients with a more guarded prognosis in order to identify areas of potential difficulty to address to increase the likelihood of a positive outcome (Lanyon, Maxwell, Karoly, & Ruehlman, 2007). Before the evaluation, it is important to put the patient at ease, as it is common for patients to minimize difficulties in fear of being deemed ineligible to have surgery (Dymek-Valentine, Rienecke-Hoste, & Engelberg, 2005). Of 500 candidates for surgery evaluated through Rhode Island Hospital and Brown University, 1 in 5, or 18%, were not initially cleared for surgery, the most commonly cited reasons being overeating to cope with stress or emotional distress, current eating disorder, uncontrolled psychopathology, and the presence of significant life stressors (Zimmerman, Francione-Witt, Chelminski, Young, Boerescu, Attiullah, et al., 2007). However, in a follow-up study, most of those
patients were able to follow the psychiatrist’s recommendation to engage in counseling and subsequently be approved for surgery. Further, individuals required to engage in psychological treatment before surgery have demonstrated similar rates of success, in terms of major complications, readmissions, reoperations, or length of hospital stay, as individuals who were not initially required to engage in collateral treatment (Blackstone, Cortes, Messer, & Engstrom, 2010).

Sogg & Mori (2004) point out that, although a preoperative evaluation is required, the type of assessment varies by site and there is little empirical data specifying which factors predict outcome. Thus, they created the Boston Interview through the Veterans Administration (VA) Boston Healthcare System, based on “empirical and clinical knowledge about compliance with medical regimens and behavioral change” (Sogg & Mori, p. 371). The Boston Interview is a semi-structured interview incorporating seven major areas of assessment: weight, diet and nutrition history; current eating behaviors; medical history; understanding of surgical procedures, risks, and the post-surgical regimen; motivation and expectations of surgical outcome; relationships and support system; and psychiatric functioning (Sogg & Mori). These areas are assessed in order to determine how obesity has affected the patient’s life, what factors may hinder or promote success, the individual’s level of cognitive functioning and knowledge regarding surgical procedures and risks, and motivation and expectations regarding surgery. The mental health professional conducting the evaluation also examines the patient’s ability to manage stress and engage in coping strategies other than overeating. This is done in order to ensure that the patient has effective coping techniques, as they will be physically unable to overeat after surgery, and must be able to engage in alternate behaviors.
Greenberg, Perna, Kaplan, & Sullivan (2005) concluded that developing pre- and post-operative treatment plans to address potential barriers to success, as well as utilizing a comprehensive multidisciplinary team that incorporates psychological and behavior change services can enhance outcome, compliance, and quality of life. Evaluation recommendations may include the following: denying approval for surgery; requiring psychotherapy/medication management; recommending psychotherapy/medication management; requiring a letter from a treating clinician or psychiatrist confirming compliance with treatment; requiring or recommending a stress management group; and “flagging” individuals (i.e., highlighting significant psychosocial problems that indicate that the patient should be closely observed during follow-up; Dymek-Valentine, Rienecke-Hoste, & Engelberg, 2005).

**Predictors of Outcome**

Most research into bariatric surgery examines the effect that surgery has upon an individual’s physical and mental health, or the complications associated with the surgical procedure (e.g., Cobbs, 2007). Several demographic variables have been identified as predictors of more positive outcome in terms of weight loss, such as lower BMI at the time of surgery, being female, being white, and being part of a higher socioeconomic status category (Toussi, Fujioka, & Coleman, 2009). However, despite the requirement for psychological evaluation pre-surgery, little research has been done about using evaluation results to predict surgical outcome in terms of excess weight lost.

In an early review of research regarding bariatric surgery candidates, Hsu and colleagues (1998) concluded that psychological disturbance and psychosocial functioning do not predict outcome in terms of weight loss, though there may be some subtle
influence. These researchers also brought up the question of whether surgery actually increases the incidence of psychological disorders, or whether losing the weight “unmasks” previously hidden disorders. Similar conclusions were drawn by Powers, Rosemurgy, Boyd, & Perez (1997) in patients who had undergone vertical banded gastroplasty (as cited in Hsu, et al., 1998).

Black, Goldstein, & Mason (2003) attempted to predict weight loss at the 6-month follow-up appointment for individuals who have had vertical gastric banding surgery using patients’ Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision (DSM-IV-TR; American Psychiatric Association, 2000) Axis I and Axis II disorders. Their findings indicated that Axis I and II disorders were not predictive of weight loss.

Averbukh and colleagues (2003) reviewed the charts of 47 individuals who completed the Beck Depression Inventory (BDI; Beck, Steer, & Brown, 1996) before gastric bypass surgery and completed one year of follow-up. The primary dependent variable, % EWL, was significantly positively correlated with BDI score ($p = 0.014$). The linear regression that was most predictive of % EWL included age ($p = .03$), BMI ($p = .01$), and BDI ($p = .04$), such that a younger age, higher BMI, and higher score (indicating a higher level of depression) on the BDI accounted for 15% of the variance in % EWL. The authors suggest that a higher depression score may be a predictor of positive outcome because it is typically positively correlated with binge eating. Binge eating causes one’s stomach to expand and thus restrictive surgery may be especially effective for these individuals. However, the authors also indicate that their sample is not representative of all gastric bypass patients, as not all patients in their clinic chose to
complete the BDI. Thus, there may be a self-selection bias. Regardless of the reason for this association, these findings suggest that a diagnosis of depression or severity of depressive symptomatology alone should not preclude an individual from being approved for gastric bypass surgery.

Ray, Nickels, Sayeed, & Sax (2003) also found that certain psychological disturbances were associated with outcome. Specifically, a history of sexual abuse and greater pre-surgical life stress were associated with less weight loss. Positive predictors included psychological coping, resiliency, and greater social support.

Although some studies have demonstrated a positive correlation between psychological distress and weight loss after surgery, this does not mean that these symptoms should not be treated. In fact, Clark and colleagues (2003) found that, in a sample of gastric bypass patients, patients who received substance abuse or psychiatric treatment lost more weight than those without treatment.

Kinzl and colleagues (2006) measured outcome in terms of decrease in BMI in laparoscopic Swedish adjustable gastric banding patients. Questionnaires concerning weight loss, satisfaction with weight loss, physical activity, eating behavior, adjustment problems, and quality of life were distributed to females who experienced this procedure at least 30 months prior to the study. Of 220 patients contacted, 140 participated. Results indicated that those with two or more psychological disorders (i.e., typically one Axis I disorder and one Axis II disorder, as compared to individuals with one or no diagnosis; $p = .047$), adverse childhood experiences (i.e., dysfunctional family background, early separation or loss, emotional neglect, and physical or sexual abuse; $p = .043$), and no prior diagnosis of an eating disorder predicted poorer outcomes in terms of
BMI decrease. Results regarding the first two variables, greater number of psychological disorders and adverse childhood experiences, were expected and explained by the fact that psychological disorders can be associated with less flexibility or adaptability to change (especially personality disorders) and childhood experiences (specifically, abuse) can be associated with lowered self-esteem and thus greater difficulty in coping with stress. However, the fact that experiencing an eating disorder predicts greater weight loss was unexpected and counterintuitive. The authors concluded that this finding was due to the fact that an individual with more disordered eating has more room for improvement. Additionally, the authors suggested that individuals experiencing obesity without disordered eating are more likely to be obese as a result of “genetic and metabolic factors than by nutritional causes” (Kinzl, et al., 2006, p. 1612) and are thus likely to experience more limited weight loss.

Severity of symptomatology. Although the research is conflicting regarding the effect of specific types of psychopathology or number of diagnosed mental disorders on surgical outcome, some research suggests that it is more important to look at the severity of symptomatology when examining predictors of weight loss. For example, Barrash, Rodriguez, Scott, Mason, & Sines (1987) examined the MMPI profiles of a sample of female patients who had undergone vertical banded gastroplasty (VBG) and found that increased severity or nature of symptoms was associated with poorer weight loss. Thus, one psychological measure that may be useful in attempting to predict outcome is the Symptoms Checklist-90-Revised (SCL-90-R; Derogatis, 1994). The SCL-90-R is a psychological measure used to assess an individual’s current level of distress. Respondents rate the extent to which each of 90 symptoms have bothered him or her in
the past week; these ratings results in nine clinical scales (i.e., somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism) and three overall indices of distress (i.e., Global Severity Index, Positive Symptoms Total, and Positive Symptoms Distress Index). In an analysis of the SCL-90-R’s use in therapy outcome, Elliott and colleagues (2006) stated that the Global Severity Index (GSI), which represents the mean of all items, is the most commonly used score in therapy outcome research. In fact, although the individual clinical scales can be studied independently, these “nine subscales collectively represent distress as a domain” which “enables the therapist to understand the client’s general level of distress” (p. 361). More specifically, the measure is assumed to be a “measure of a single, unitary construct” (p. 361). Taking this into consideration, it appears that it would be useful to examine the SCL-90-R as a predictor of outcome of gastric bypass surgery. Utilizing a measure of overall distress, as opposed to a specific type of symptomatology, may allow for more effective predictions of outcome in the bariatric surgery patient population.

*Eating behavior.* Several studies have examined the impact of eating behavior on surgical outcome. Frensley (2007) used the Eating Inventory (EI; referred to in other research as the Three-Factor Eating Questionnaire; Stunkard & Messick, 1985) to predict weight loss in terms of actual weight (in pounds) lost after laparoscopic banding. Weight loss was measured at 6- and 9-month follow-up and patients were divided into two groups: those that lost more than or equal to the amount typical of laparoscopic banding (i.e., Normal Weight Loss group; NWL) and those that lost less weight than is typical for the procedure (i.e., Low Weight Loss group; LWL). Specifically, at 6 months, patients
are expected to have lost 26 lbs. and at 9 months they are expected to have lost 39 lbs. Group membership was predicted based on the profile individuals obtained on the Eating Inventory. Results indicated that high or clinically elevated scores on the Cognitive Restraint scale (i.e., cognitive control of eating behavior) and a Null (i.e., no clinical elevation on any of the scales) profile predicted better outcomes. This study provides useful information in terms of identifying one type of eating behavior (i.e., the ability to restrain oneself from overeating) in the prediction of successful weight loss. However, two limitations were evident: the measure of success as an all or nothing phenomenon and the definition of success. Specifically, by grouping individuals according to “normal” versus “low” weight loss in terms of lost pounds, it suggests that an individual must simply lose a specific amount of weight to be determined “successful,” regardless of pre-surgical weight or BMI. This is problematic in that information is lost about the degree of success and what this means for the individual. It may be more appropriate to measure success in terms of percent excess weight lost: a continuous variable that indicates level of success and a percentage that indicates the degree of change for the individual.

One significant conclusion that appears consistent in terms of eating behaviors was that binge-eating leads to a less favorable outcome (Kalarchian, et al., 2002; Toussi, Fujioka, & Coleman, 2009) and more weight regain post-surgery in gastric bypass patients (Hsu, et al., 1998). Also, in a study of 50 vertical banded gastroplasty patients (Pessina, Andreoli, & Vassallo, 2001), it was found that more postoperative vomiting, as measured at 1, 3, and 6 months post-surgery, was associated with less excess weight lost.
Other studies, however, have concluded that preoperative eating pathology (e.g. bingeing) is not associated with weight outcomes. For example, in a longitudinal prospective study, Powers, Perez, Boyd, & Rosemurgy (1999) examined the role of presurgical disordered eating on outcome in 77 patients who had undergone gastric restrictive surgery an average of 5.5 years earlier. Fifty-five percent of participants were placed in the “eating disorder symptom” group as a result of having been diagnosed with Binge Eating Disorder (BED) or Night Eating Syndrome (NES); or having reported bingeing at least weekly presurgery. Results of \(t\)-tests between the “eating disorder symptom” group and the rest of the sample indicated that at 1-year follow-up, patients who had been diagnosed with NES weighed significantly more than those without a diagnosis; however, this difference was no longer found in the final follow-up session. This suggests that, although disordered eating may be associated with poorer short-term outcomes, these symptoms are not likely to predict long-term outcomes.

Post-operative behaviors and psychological measures. Some studies claim to predict outcome, but do so during the post-operative period. More specifically, they predict outcome based on eating behaviors measured after surgery. Although the associations are significant and suggest a need for post-surgery psychological treatment, these factors cannot truly “predict” weight loss if they are measured after the majority of weight loss has taken place. For example, Kalarchian (1999) utilized the Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Cooper, 1993; Fairburn & Beglin, 1994) and Three-Factor Eating Questionnaire (TFEQ; Stunkard & Messick, 1985) to predict weight loss in terms of decrease in BMI in gastric bypass patients. Of 156 patients contacted, who had undergone surgery two to seven years prior to the study, 99
participated in the study. Being European-American, having a higher preoperative BMI, more diuretic misuse, more overeating, less hunger, and lower concern regarding weight was associated with a larger decrease in BMI and these factors accounted for 53% of the variation in outcome. Again, although this is valuable information in terms of behaviors to explore in order to create effective treatment plans for individuals who wish to have bariatric surgery, it does not allow one to draw conclusions about prospectively predicting weight loss before the surgical procedure.

MMPI-2 (Hathaway & McKinley, 1989) scales. The MMPI-2 is a psychological measure used to assess personality characteristics (e.g., interpersonal interaction styles, attitudes toward authority members, etc.), obtain information about an individual’s symptom profile (i.e., whether or not they experience symptoms of psychological disorders such as anxiety, depression, or schizophrenia), and explore one’s response style (i.e., it includes validity and consistency scores which enable the assessor to determine how one tends to view and present oneself). This scale consists of 567 self-descriptive true-false items on which respondents are asked to assess how accurate the items are in describing themselves. It has demonstrated acceptable psychometric properties (Hathaway & McKinley, 1989; Butcher & Pope, 1992).

The MMPI-2 provides a wealth of information. It informs the assessor of any psychopathology in need of treatment, which will likely improve chances of success in the case of bypass surgery. In addition, by exploring the individual’s personality characteristics and response style, the assessor can hypothesize what is likely to affect the candidate’s chances of success and subsequently plan for effective treatment strategies if needed. The MMPI-2 has been used to effectively predict treatment outcomes for a
variety of medical issues including surgery for low back pain (Masters, Shearer, Ogles, & Schleusener, 2003; Shearer, 2001) and chronic pain in men (Clark, 1996). It is a commonly used personality inventory to measure psychological symptoms during the preoperative psychological evaluation for bariatric surgery (Kral, 2001).

Given its potential predictive value, it would be beneficial to have empirical data to support the use of the MMPI-2 as a predictive measure of success after surgery. Thus far, only four studies have examined patient scores on the MMPI-2 in relation to gastric bypass surgery. Two of these studies used the MMPI-2 only to describe the typical characteristics of individuals seeking weight-loss surgery (Glinski, et al., 2001) and how profiles change six to 12 months after having surgery (Maddi, Fox, Harvey, Lu, Khoshaba, & Persico, 2001). Glinski and colleagues (2001) conducted a qualitative analysis of 115 gastric bypass patients’ pre-surgical clinical interviews and MMPI-2 reports in order to describe typical personality profiles for these individuals. They found that 50% currently (i.e., before surgery) met criteria for a DSM-IV-TR Axis I disorder and that 70% met criteria for a current and/or past Axis I disorder, with depressive disorders being the most common. In addition, 36% of patients met criteria for an Axis II disorder, most commonly, personality disorder, not otherwise specified (i.e., they showed evidence of a pattern of behavior and attitudes which were pervasive and inflexible, but did not meet criteria for a specific personality disorder as defined in the DSM-IV-TR). One common personality theme was for individuals to deny problems and present themselves in a favorable light. Evidence of this was found in MMPI-2 profiles in which 63% of patients had an elevation on a social desirability scale and 27% had an elevation on the Lie scale (L), which is an indicator of the tendency to present oneself in an overly
favorable manner. The authors suggest that this could be due to an attempt to ensure they are approved for surgery, but could also indicate a personality trait. In other words, these patients may have a tendency to use denial (e.g., of possessing negative traits) as a defense mechanism and may turn to food to escape negative feelings. Since this calls into question the validity of the MMPI-2 clinical profiles in that sample, it supports the intention of the current study to instead utilize the validity scales as possible predictors for surgical outcome.

In a national sample of gastric bypass patients, Maddi and colleagues (2001) also found presurgery profiles of the MMPI-2 to reflect higher than average levels of psychopathology. However, when administered again between 6 months and one year post surgery, the level of psychopathology decreased significantly to at or below the normative population. The authors conclude that the prevalence of mental disorders before surgery may be due to the consequences and sequelae of obesity and patients’ reactions to it, and that the decrease in psychopathology following surgery indicates that patients are becoming more positive or hopeful about their lives.

Only two studies have examined the predictive power of the MMPI-2 in terms of excess weight loss. Tsushima, Bridenstine, & Balfour (2004) reviewed the records of 52 patients who had undergone gastric bypass surgery and had been administered the MMPI-2, on average, 18 days before surgery. In this study, as in Frensley’s (2007) study, participants were split into two groups based on excess weight loss one year after having surgery: one in which patients lost more than 50% of their excess weight (i.e., fifty plus weight loss (50+WL) group) and one in which patients lost less than 50% of their excess weight (i.e., fifty minus weight loss (50-WL) group). Results of independent


$t$-tests between both groups indicated that the 50-WL group scored significantly higher on the F, Hysteria, Paranoia, and Health Concerns scales and significantly lower on the Masculinity-Femininity scale than the 50+WL group. However, the majority of $T$-score scale means fell below the clinical cut-off of $T=65$. The only means that surpassed the cut-off were the $T$-scores on the Hypochondriasis ($T = 67.1$) and Hysteria ($T = 65.2$) scales for the 50-WL group. The authors conclude that their findings support the contention that obese individuals as a group do not exhibit more psychological symptoms than non-obese individuals (Fitzgibbon, Stolley, & Kirschenbaum, 1993; Fontaine, Bartlett, & Barofsky, 2000; Kolotkin, Meter, & Williams, 2001). Concerning the differences they found between groups, stepwise regression analyses indicated that the best predictor of weight loss was a combination of the Masculinity-Femininity scale and Health Concerns subscale. The authors did not offer an explanation of these findings, but do indicate several limitations of their study and a need to replicate the results. First, only 52 patients of the 88 records reviewed were utilized in the study, as 32 people did not have a one-year follow-up visit (i.e., the only time frame in which success was examined). Additionally, three participants were excluded due to extreme elevations on the L and F validity scales. Thus, the patients who were not included may have added valuable information about what scales predict a poorer outcome. It seems important to examine success at regular intervals from three months to at least two years.

Hutchinson (2009) also examined scales of the MMPI-2 (as well as the Overeating Questionnaire) to determine their predictive power in determining which individuals would be successful in terms of $\%$EWL after gastric bypass surgery. Results indicated that individuals scoring higher on the Hypomania (Scale 9) and Aberrant
Experiences (Scale RC8) scales lost less weight between one year and two years post-surgery than individuals scoring in a lower range on these scales. It was also concluded that Scale RC8 was the single best predictor of outcome, and that this could be due to this scale reflecting behaviors involving poor judgment and poor adherence to post-surgical recommendations. Similarly, Larsen, et al. (2004) found that egoism [as measured by the Dutch Personality Questionnaire, derived from the California Personality Inventory (Gough, 1996)], a personality trait that is associated with self-enriching and self-centered behaviors, and thus similar to constructs comprising both the hypomania and psychopathic deviate scales of the MMPI-2, was a marginally significant predictor of weight loss after laparoscopic adjustable gastric banding. Present research suggests that these scales may be more internally consistent measures of hesitation to be candid with medical providers, and may thus predict poor adherence to postsurgical guidelines. As a group, extant results suggest that more research is needed to determine the predictive value of the validity scales of the MMPI-2.

Bannen, Lambert, Gustafson, Mathiason, Larson, & Kothari (2008) attempted to identify what they called “challenging to manage” patients based on MMPI-2 scores obtained preoperatively in order to identify patients who may have difficulty losing weight in the postoperative period or who may not be adequately prepared for a surgery of this nature. “Challenging to manage,” or CM, patients were loosely defined as those who demonstrated “nonadherence to protocol, ongoing physical complaints with no objective findings, and inconsistent participation in follow-up appointments” (p. 212); specifically, they met at least two of the following criteria: failure to keep follow-up appointments, failure to take supplements, failure to eat according to postsurgical
guidelines, and physical complaints and/or readmissions without objective findings. Only six of 110 patients were deemed challenging to manage. This small group of patients demonstrated significantly higher scores than their non-challenging to manage counterparts on the VRIN, F, Fb, and Fp validity scales and Depression (Scale 2) and Paranoia (Scale 6) clinical scales, and significantly lower scores on the K and S validity scales. Although this appears to be one good initial step in using the scales of MMPI-2 to predict post-surgical behaviors, the authors point out that this study needs to be replicated with a larger group of ethnically diverse CM patients in order to determine whether the results obtained are generalizable to the population of individuals seeking weight loss surgery.

The Present Study and Hypotheses

The current study’s purpose was to determine whether validity scales and selected clinical scales on the MMPI-2, as well as global indices of distress measures on the SCL-90-R, and psychosocial variables obtained from the presurgical psychological evaluation, have predictive power in determining which individuals will be successful after having gastric bypass surgery as measured by percent excess weight lost at follow-up.

The following hypotheses and exploratory questions concerning the MMPI-2, SCL-90-R, and variables reported in the psychological evaluation were offered:

**Hypothesis 1:** The validity scales of the MMPI-2 (i.e., F, L, K, and S) would predict outcome in terms of % EWL such that higher T-scores on these scales would predict lower % EWL at follow-up.

**Hypothesis 2:** Global indices of distress [i.e., Global Severity Index (GSI), Positive Symptoms Total (PST), and Positive Symptoms Distress Index (PSDI)], as
measured by the SCL-90-R, would be predictive of outcome in terms of % EWL such that higher T-scores on all three scales would predict lower % EWL.

Exploratory Questions

**Question 1:** Would scales 1 (Hs), 2 (D), and 3 (Hy) and the negative treatment indicator content scales (TRT) of the MMPI-2 predict outcome in terms of % EWL? It was expected that higher T-scores on Scales 1, 3, and TRT would predict lower % EWL. Based on previous research, it was unclear what to expect regarding scale 2. Some research suggests that a higher level of depression (in this case, a higher T-score on scale 2) predicts a more positive outcome (Averbukh, et al., 2003), while other studies have found that a higher level of psychopathology in general predicts poorer outcomes (Kinzl et al., 2006).

**Question 2:** Would subscales of scale 4 (Pd) of the MMPI-2, specifically, the Harris-Lingoes subscales (Harris & Lingoes, 1955; 1968) Pd1: Familial Discord and Pd2: Authority Problems, predict outcome in terms of % EWL? It was expected that higher T-scores on both scales would predict lower % EWL at follow-up.

**Question 3:** Would variables described in the psychological evaluation report predict outcome in terms of % EWL? It was expected that more diagnosed DSM-IV-TR disorders on Axes I and II, more reported stressors, and fewer reported coping techniques as listed in the psychological evaluation report would predict lower % EWL.
Chapter 3
Method

Participants

A power analysis was conducted to determine the number of participants needed. Based on previous research, there was a medium population effect size for the hypothesis that scales of the MMPI-2 could predict post-operative outcome in terms of excess weight lost (Tsushima, Bridenstine, & Balfour, 2004). Thus, in order to have 80% confidence of detecting an effect of this size in the current study (i.e., power = .80) with alpha set at .05, and a maximum of four predictors per hypothesis, a total of at least 84 participants was needed (Cohen, 1992).

Potential participants were 111 individuals who had been evaluated for bariatric surgery between 2005 and 2009 by a community mental health agency and subsequently followed by a surgeon who performed the surgery, in a medium-sized Midwestern city. These individuals were initially identified through a list of individuals, who had consulted with a local surgeon who performs bariatric surgery, obtained by the researcher from the surgeon’s medical staff. The sample consisted of obese (or formerly obese) individuals ages 18 and over. This sample consisted of 104 (93.7%) females and 7 (6.3%) males. Sixty-five (58.6%) individuals were European-American, 38 (34.2%) were African-American, five (4.5%) were Hispanic, two (1.8%) identified themselves as having two ethnic backgrounds, and one (0.9%) was Asian. Of the 111 identified
potential participants, data were analyzed for only 63 participants for several reasons (see Figure 1). First and foremost, psychological testing data and/or medical information were not available for 42 (37.8%) participants, due to incomplete charts ($n=40$) and individuals who did not follow-through with having surgery ($n=3$). This was an unforeseen limitation; however, as this restriction of data was not due to characteristics of the participants, it was not expected to have biased the results in any way. Once these participants’ files were eliminated, only two males remained in the dataset. It was no surprise that this sample consisted of more females than males due to women being much more likely to undergo bariatric surgery (Mazzeo, Saunders, & Mitchell, 2005). However, the two males’ data files were eliminated, as they would likely create outliers or data that did not match with the rest of the dataset in terms of psychological variables, as women perceive obesity as being more distressing (Fadakar, 2005; Ferguson, Kornblet, & Muldoon, 2009), and physical variables, as gender has been demonstrated as a predictor of weight loss (Larsen, Geenen, Maas, de Wit, van Antwerpen, Brand, et al., 2004) and maintenance (Harrington, 2009). Another unforeseen restriction was the fact that 8 women (7.7% of the female potential participants) became pregnant within two years after surgery, thus, their data were unusable for the current study. This finding may speak to the increase in fertility seen after a significant weight loss. However, this topic is outside of the scope of the current study (for more information, refer to the following studies: Printen & Scott, 1982; Wittgrove, Chester, Wittgrove, & Clark, 1998).

In the final dataset, consisting of 63 participants, 31 (49.2%) were European-American, 27 (42.9%) were African-American, four (6.3%) were Hispanic, and one (1.6%) identified with two ethnic backgrounds. The mean age of the sample was 35.44
(SD = 7.1), while the mean weight of the participants during the psychological evaluation was 300 pounds (SD = 46.33; mean BMI = 49.9, SD = 6.07). Participants reported a mean of 2.49 (SD = 1.05) obesity-related diseases (ORDs) before surgery (i.e., 19% reported diabetes; 38.1% reported hypertension; 14.3% reported sleep apnea; 44.4% reported GERD; 92.1% reported arthralgia; 3.2% reported other pain; 20.6% reported asthma; 3.2% reported intracranial hypertension; and 14.3% reported urinary stress incontinence).

In terms of psychological variables, participants were diagnosed with a mean of 1.1 DSM-IV-TR diagnoses (SD = 0.93; obtained range = 0 – 4; see Table 1 for number of Axis I diagnoses and Table 2 for specific diagnoses) and they reported a mean of 2.33 stressors (SD = 1.32) and 2.2 coping mechanisms (SD = 1.69). None of the participants were diagnosed with Axis II disorders; thus, this variable was eliminated from all further analyses. The reason that no Axis II disorders were diagnosed in this sample could have been a lack of complete background information obtained. More specifically, because these individuals were likely only seen once for the presurgical psychological screen, the clinicians may not have gathered enough information to make the determination of a personality disorder, which is more long-standing and less transient than most Axis I diagnoses. Examination of typical profiles for both the MMPI-2 and SCL-90-R did not identify any clinically significant elevations on any scale of these measures (see Tables 3 and 4, respectively).

At three months post-surgery (n = 60 participants out of 63 participants with the potential to present for this appointment; 95%), participants exhibited a mean of 40.88 (SD = 10.91; obtained range = 25 - 72) %EWL; a mean weight of 242.67 (SD = 41.5)
pounds; a BMI of 40.6 ($SD = 5.84$) kg/m$^2$; and 1.29 ($SD = 0.91$) ORDs. European Americans ($M = 44.6$, $SD = 12.52$) demonstrated a statistically significantly higher %EWL than African Americans ($M = 37.46$, $SD = 7.67$) at three months post-surgery ($t(48.91) = 2.61$, $p < .05$). Participants who did not keep this appointment demonstrated a trend toward higher scores on scale Pd2 than those that did keep the appointment ($t(61) = -1.97$, $p = .054$; see Table 5).

At six months post-surgery ($n = 52$ participants out of 61 participants with the potential to present for this appointment; 85%), participants exhibited a mean of 61.51 ($SD = 17.17$; obtained range = 38 - 115) %EWL; a mean weight of 215.64 ($SD = 39.28$) pounds; a BMI of 35.73 ($SD = 5.46$) kg/m$^2$; and 1.06 ($SD = 0.84$) ORDs. European Americans ($M = 67.72$, $SD = 20.06$) demonstrated a statistically significant higher %EWL than African Americans ($M = 56.79$, $SD = 11.69$) at six months post-surgery ($t(38.91) = 2.34$, $p < .05$). Participants who did not keep this appointment demonstrated significantly higher scores on scales Pd2 ($t(59) = -2.17$, $p < .05$) and F ($t(59) = -2.9$, $p < .01$), than those that did keep the appointment (see Table 6).

At one year post-surgery ($n = 26$ participants out of 47 participants with the potential to present for this appointment; 55%), participants exhibited a mean of 83.07 ($SD = 19.91$; obtained range = 53 - 131) %EWL; a mean weight of 181.69 ($SD = 32.08$) pounds; a BMI of 30.27 ($SD = 4.95$) kg/m$^2$; and 0.81 ($SD = 0.80$) ORDs. Weight loss did not differ significantly by ethnicity at one-year post-surgery. Participants who did not keep this appointment did not demonstrate significantly different scores on any predictor variable than those who did keep the appointment (see Table 7).
At two years post-surgery, 9 participants out of 21 participants with the potential to present for this appointment (43%), participants exhibited a mean of 76.5 (SD = 21.47; obtained range = 45 – 118) %EWL; a mean weight of 180.2 (SD = 32.72) pounds; a BMI of 31.41 (SD = 5.93) kg/m$^2$; and 0.80 (SD = 0.79) ORDs. Weight loss did not differ significantly by ethnicity at one-year post-surgery. Participants who did not keep this appointment did not demonstrate significantly different scores on any predictor variable than those who did keep the appointment (see Table 8).

Procedure

All patients who had been evaluated for bariatric surgery by the participating surgeon and his medical staff were identified through a list of patients evaluated between 2006 and 2009 provided to the researcher by the surgeon’s medical staff. Subsequently, the researcher determined which clients had been assessed as part of a bariatric surgery preoperative psychological evaluation by the participating community mental health agency by searching for each name in the electronic medical record and reviewing the referral sheet. Evaluations of individuals who had been psychologically evaluated for gastric bypass surgery at the community mental health agency were reviewed. Specifically, the psychological evaluation report was reviewed (i.e., for number of Axis I and II diagnoses, number of self-reported stressors, and number of self-reported coping mechanisms), as well as the results of the psychological scales administered (i.e., Minnesota Multiphasic Personality Inventory, 2$^{nd}$ Edition (MMPI-2; Hathaway & McKinley, 1989) and Symptoms Checklist 90, Revised (SCL-90-R; Derogatis, 1994)). The MMPI-2 was used to assess personality characteristics and obtain information about the individual’s psychological symptom profile (i.e., their currently experienced
psychological symptoms), while the purpose of the SCL-90-R was to assess current levels of emotional and psychological distress.

After psychosocial information was obtained from patients’ psychological medical records at the community mental health agency, medical records for the corresponding clients were obtained from the surgeon’s medical office in order to obtain information regarding weight history (i.e., pre-surgical weight and weight at all follow-up appointments) and status of obesity-related diseases. This process was approved and conducted in accordance with the University of Toledo’s Institutional Review Board policies, as well as the Quality Assurance Team of both the surgeon’s office and the community mental health agency.

Materials

*Minnesota Multiphasic Personality Inventory, 2nd Edition* (MMPI-2; Hathaway & McKinley, 1989). The MMPI-2 is a psychological measure used to assess personality characteristics and obtain information about one’s symptom profile. This scale consists of 567 self-descriptive true-false items. Respondents are asked to assess how accurate the items are in describing themselves. Eight validity and 10 clinical scales are reported. If all validity scales fall within the normal range, the clinical profile can be interpreted. Cronbach’s alpha estimates, measures of internal consistency, were at an acceptable level of .62 to .73 for males and .57 to .71 for females for the validity scales and .58 to .85 for males and .61 to .87 for females for the majority of the clinical scales in a community sample (Hathaway & McKinley, 1989). For males, the Paranoia scale failed to demonstrate an acceptable level of internal consistency (Scale 6; Pa; \( \alpha = .34 \); Hathaway & McKinley, 1989). For females, the following scales failed to demonstrate an acceptable
level of internal consistency: Masculinity-Femininity (Scale 5; Mf; \( \alpha = .37 \)) and Paranoia (Scale 6; Pa; \( \alpha = .39 \); Hathaway & McKinley, 1989). However, test-retest coefficients for a community sample were considered to be acceptable, with coefficients ranging from \( r = .77 \) to \( r = .84 \) on validity scales for male community adults, and from \( r = .69 \) to \( r = .81 \) for female community adults (Hathaway & McKinley, 1989). On clinical scales, these coefficients ranged from \( r = .67 \) to \( r = .92 \) on for male community adults, and from \( r = .58 \) to \( r = .91 \) for female community adults. All test-retest coefficients were calculated with a mean interval of 8.58 days between test administrations (Hathaway & McKinley, 1989). The scale also has acceptable concurrent, convergent, and divergent validity (Hathaway & McKinley, 1989).

The following scales, subscales, and content scales were examined in the current study in order to determine their predictive power regarding percent excess weight loss:

*Lie Scale (L).* This is a validity scale designed to detect intentional efforts to underreport problems. An elevation on this scale is often referred to as “faking good,” or responding in a socially desirable manner. A \( T \)-score greater than 60 suggests that the individual presented a naively defensive attempt to appear extremely virtuous, moral, self-controlled, and free from commonplace weaknesses. It also suggests poor self insight, a rigid, stereotypic, ineffective style of coping, and a tendency to overuse denial and overestimate one’s own qualities.

*Correction Scale (K).* This is a scale that was developed in order to gain a more accurate measure on the clinical scales by adding a correction factor to the scaled scores. Thus, it is a measure of defensiveness which, if elevated, suggests
that the clinical scales are likely lower than they would be had the participant responded in an open and honest manner. This scale is sensitive to more subtle, “sophisticated,” expressions of defensiveness and underreporting of symptoms. Individuals obtaining clinical elevations on this scale (i.e., $T > 55$) present a good social façade, conceal problems and weaknesses, and may view psychotherapy as unnecessary. They may not be interested in changing and may present as unmotivated for treatment. Contrastingly, very low scores on this scale (i.e. $T < 40$) indicate an individual who feels overwhelmed and defenseless.

*Superlative Self-Presentation Scale (S).* This scale is a measure of the tendency to present oneself in a superlative, or overly positive, manner. Individuals obtaining clinical elevations on this scale may claim extraordinary adjustment and deny common weaknesses or character flaws.

*Infrequency Scale (F).* This is another validity scale, which measures an individual’s openness in disclosing psychological problems and tendency to respond to items in an unusual manner (i.e., in the opposite direction of 90% of the normal population). Very high clinical elevations on this scale (i.e., $T > 90$) suggest exaggeration or faking of psychological problems, while moderately elevated scores (i.e., $75 < T < 90$) indicate an individual who may feel overwhelmed with his or her problems.

*Hypochondriasis (Hs).* This clinical scale represents the degree to which a person is denying good physical health. Elevations are indicative of an unrealistic interpretation of physical signs or sensations as abnormal, many vague stress related physical complaints, somatic hypervigilance, and underlying emotional
conflict and dependency. However, individuals with documented health problems are likely to endorse many of the items that make up this scale as well. Typically, these individuals score in the *slightly* elevated range on this scale (i.e., $T = 58$ to 64) and are more likely to score in the clinically elevated range on the Depression scale (i.e., Scale 2; Greene, 2000). Thus, even if individuals do experience actual health problems, a clinical elevation on the Hypochondriasis scale indicates that they are likely to be misinterpreting at least some of their physical symptoms. An elevation on this scale indicates that the individual is likely to seek medical solutions to problems and resist psychological interpretations, and often demonstrate a cynical attitude toward life and low motivation for change.

*Depression (D).* This clinical scale measures depressive symptoms such as depressed mood, feelings of hopelessness, worry, self-doubt and low self-esteem, cognitive inefficiency, poor concentration, physical complaints and vegetative symptoms, and thoughts of death or suicide. Individuals obtaining a clinical elevation on this scale are often motivated for treatment to alleviate distress. They tend to engage in and remain in treatment and are amenable to action-oriented therapies to improve mood and stimulate interest and activity.

*Hysteria (Hy).* This scale measures sensory or motor difficulties with no apparent underlying biological cause and a denial of problems in one’s life. Like scale 1, it also reflects many vague, stress related physical complaints. Additionally, it is indicative of poor psychological insight, denial and repression, forced optimism, anxiety, an intense need of affectionate attention, and an individual who is likely self-centered, demanding, and lacking in maturity.
Individuals obtaining clinical elevations on this scale also tend to seek medical solutions to problems and resist psychological interpretations. They tend to demonstrate a low motivation for change, overlook their own personal weaknesses, and sometimes receive secondary gain for their symptoms.

*Psychopathic Deviate (Pd).* This scale is a measure of an individual’s problems with the law, willingness to acknowledge this trouble, and lack of concern regarding social and moral standards of conduct. Individuals obtaining elevations on this scale are viewed as rebellious and defiant, may be unreliable and manipulative, reject societal standards, demand immediate gratification, but may also present as energetic, outgoing, and charming. In terms of treatment implications, these individuals pose a substance abuse risk, may be unmotivated to change, may be intolerant of emotional discomfort, and often demonstrate premature termination.

*Familial Discord (Pd1).* This is a Harris-Lingoes subscale (Harris & Lingoes, 1955; 1968) of the Psychopathic Deviate Scale. It measures past and current problems within one’s family and a desire to escape a subjectively negative home environment. More specifically, it refers to an unpleasant family life characterized by little love, emotional support, or understanding.

*Authority Problems (Pd2).* This is a Harris-Lingoes subscale (Harris & Lingoes, 1955; 1968) of the Psychopathic Deviate Scale. It measures past delinquent behavior and legal involvement and a lack of constraint. In addition, it reflects attitudes and behaviors that indicate a rejection of authority and run-ins with societal limits.
Negative Treatment Indicators (TRT). This supplementary scale measures attitudes towards doctors and mental health professionals. Elevations on this scale indicate that the respondent may not want to change anything in his or her life or feel that no one can help him or her.

Low Motivation (TRT1). This TRT content subscale reflects apathy, an external locus of control, and a tendency to quickly give up in the face of obstacles because of a depletion of personal resources. Individuals obtaining clinical elevations on this scale likely feel helpless and lack motivation to the point that problem solving in the face of diversity may seem futile or pointless, causing the individual to simply give up.

Inability to Disclose (TRT2). This TRT content subscale reflects a hesitation to share personal information with others and significant discomfort when asked to do so. Individuals obtaining clinical elevations on this scale will most likely choose not to reveal personal problems to others.

Symptoms Checklist-90-Revised (SCL-90-R; Derogatis, 1994). The SCL-90-R is used to assess an individual’s current level of distress and demonstrate “psychological symptom patterns of community, medical, and psychiatric respondents” (Derogatis, p. 5). Respondents rate the extent to which each symptom has bothered them in the past week for 90 items on a 5-point Likert scale from 0 (Not at all) to 4 (Extremely). Responses result in nine clinical scales and three global indices of distress: the Global Severity Index (GSI), which measures the depth of distress, the Positive Symptoms Total (PST), which measures the breadth of psychological symptoms, and the Positive Symptoms Distress Index (PSDI), which rates the intensity of currently experienced symptoms. This
checklist has demonstrated acceptable internal consistency, with Cronbach’s alpha ranging from .77 to .90, and test-retest coefficients ranging from .68 to .90, with one to 10-week test-rest intervals, for clinical scales (Derogatis). In addition, the SCL-90-R has demonstrated acceptable convergent-discriminant validity with scales on the MMPI-2 (Derogatis, Rickels, & Rock, 1976) and the Middlesex Hospital Questionnaire (now called the Crown-Crisp Experiential Index; Crown & Crisp, 1979; Bolelouchy & Horvath, 1974). See Derogatis for a list of additional validity studies for the SCL-90-R.
Chapter 4

Results

As stated previously, participants exhibited a mean of 40.88 \%EWL (SD = 10.91) at three months post-surgery; 61.51 \%EWL (SD = 17.17) at six months post-surgery; 83.07 \%EWL (SD = 19.91) at one year post-surgery; and 76.5 \%EWL (SD = 21.47) at two years post-surgery. Correlational analyses demonstrated that an individual’s pattern of weight loss appeared to be somewhat consistent over time (See Table 9). Specifically, weight loss at each point in time was significantly positively correlated (except for the correlation between 3 months and 2 years, which likely did not have enough statistical power to detect an effect), such that as a participant’s \%EWL increased at 3 months post-surgery, it also increased at 6 months and 1 year post surgery. However, based on the mean \%EWL across time, it was demonstrated that, although participants continued to lose weight until the one year point, they appeared to begin gaining some of the weight back by two years post-surgery. Change in \%EWL from one to two-years post-surgery ranged from -18\% (i.e., gained back 18\% of their excess weight) to +10\% (i.e., lost an additional 10\% of their excess weight). Overall, compared to one year post-surgery, participants demonstrated a mean decrease in \%EWL of 2.8\% at two years post-surgery (i.e., participants, on average, gained back 2.8\% of their excess weight between 1 and 2 years post-surgery; SD = 10.08). Because participants, on average, lost weight until one year post-surgery, at which point, they began to slowly gain weight back, further analyses
and hypotheses were modified to take this trend into consideration. Thus, predictor variables were examined as described for three months, six months, and one year post-surgery in order to predict %EWL as a short-term outcome variable.

In order to examine the effect the hypothesized predictors had on long-term weight maintenance, a change score was first created by calculating the difference between %EWL at one year and %EWL at two years post-surgery (i.e., subtracting the %EWL at one year from the %EWL at two years post-surgery such that a negative score would indicate that the participant’s %EWL had decreased over time and that they had gained weight). Sets of predictors (i.e., grouped by hypothesis or exploratory question) were then each examined independently to determine their ability to predict the change score, which represented maintenance of weight loss as a long-term outcome variable (now referred to as Exploratory Question 4).

**Bivariate Correlations**

Bivariate correlations were conducted among T-scores for all validity, clinical, and content scales of the MMPI-2, T-scores for clinical scales and global indices of distress for the SCL-90-R, variables described in the psychological report (i.e., number of Axis I diagnoses, number of self-identified stressors, and number of self-reported coping mechanisms), percent excess weight lost (%EWL) at each follow-up visit, and weight loss maintenance. In terms of predictor variables, %EWL at three months, six months, one year, and two years post-surgery, and maintenance of weight loss from one year to two years post-surgery were not individually significantly correlated with any of the hypothesized predictor variables. However, several correlations demonstrated a trend in the data, including those between %EWL at 3 months and scale Pd2 ($r = -0.23, p = 0.084$);
%EWL at 6 months and scale F ($r = .25, p = .068$), scale 2 ($r = .26, p = .066$), scale Pd2 ($r = -.256, p = .064$) and Axis I diagnoses ($r = .267, p = .054$); %EWL at one year post-surgery and number of coping mechanisms ($r = .372, p = .088$); and %EWL at two years post-surgery and scale 1 ($r = .606, p = .063$). In addition, consistent with prior research, preoperative BMI was significantly correlated with %EWL at three months ($r = -.73, p < .001$), six months ($r = -.70, p < .001$), and one-year post-surgery ($r = -.60, p < .01$), such that a lower preoperative BMI was associated with a higher %EWL at follow-up.

**Bivariate Correlations for Predictor Variables By Hypothesis**

**Hypothesis 1.** Bivariate correlations were conducted for $T$-scores on scales F, L, K, and S of the MMPI-2. Results indicated that the $T$-score for scale F was significantly correlated with the $T$-scores of scales K ($r = -.359, p = .004$) and S ($r = -.47, p < .001$). In addition, the $T$-score for scale L was significantly correlated with the $T$-scores of scales K ($r = .44, p < .001$) and S ($r = .551, p < .001$); and the $T$-score for scale K was correlated with that of scale S ($r = .812, p < .001$). Thus, to control for multicollinearity, only the $T$-scores for scales F and L were used as predictors in this hypothesis.

**Hypothesis 2.** Bivariate correlations were conducted for $T$-scores on the GSI, PSDI, and PST of the SCL-90-R. Results indicated that the $T$-score for the GSI was significantly correlated with the $T$-scores for the PSDI ($r = .408, p < .01$) and PST ($r = .882, p < .001$), and the correlation between $T$-scores for the PSDI and the PST almost reached the threshold for statistical significance ($r = .266, p = .05004$). Thus, to control for multicollinearity, only the $T$-score for the GSI was used as a predictor in this hypothesis, as it takes breadth and intensity of symptoms into account to create a measure.
of the depth of one’s current distress (Derogatis, 1994). Because only one predictor was examined in this hypothesis, there was no need to conduct a multiple regression analysis. None of the correlations between $T$-score on the GSI and %EWL at 3 months ($r = .01, p = .92$), 6 months ($r = .02, p = .91$), one year ($r = .07, p = .74$), or two years post-surgery ($r = .42, p = .26$) or weight maintenance from one to two years post-surgery ($r = .09, p = .82$) were significant. Further, none of these comparisons represented a detectable effect size, aside from the relationship between $T$-score on the GSI and %EWL two years post-surgery, which represented a medium effect size ($r = .42$).

**Exploratory Question 1.** Bivariate correlations were conducted for $T$-scores of scales 1 (Hs), 2 (D), and 3 (Hy), and the negative treatment indicator subscales (TRT1: Low Motivation and TRT2: Inability to Disclose) of the MMPI-2. Results indicated that the $T$-score for scale 1 was significantly correlated with the $T$-scores for scales 2 ($r = .55, p < .001$), 3 ($r = .81, p < .001$), TRT1 ($r = .38, p < .01$), and TRT2 ($r = .28, p < .05$). The $T$-score for scale 2 was significantly correlated with the $T$-scores for scales 3 ($r = .37, p < .01$), TRT1 ($r = .62, p < .001$), and TRT2 ($r = .59, p < .001$). The $T$-score for scale 3 was not significantly correlated with the $T$-score for scales TRT1 ($r = .2, p = .12$) or TRT2 ($r = .12, p = .36$); however, the $T$-scores for scales TRT1 and TRT2 were significantly correlated with each other ($r = .62, p < .001$). Thus, to control for multicollinearity, only the $T$-scores for scales 3 (Hy) and TRT2 (Inability to Disclose) were used as predictors in this exploratory question. Scale TRT2 was chosen over scale TRT1 because conceptually, an inability to disclose may prevent someone from obtaining the help they need in following physicians’ recommendations. Thus, they may not obtain
help despite the intention to follow those guidelines, which may ultimately prevent optimal weight loss.

**Exploratory Question 2.** Bivariate correlations were conducted for $T$-scores of scales Pd1 (Familial Discord) and Pd2 (Authority Problems) of the MMPI-2. Results indicated that the $T$-score for scale Pd1 was not significantly correlated with the $T$-score for scale Pd2 ($r = .21, p = .09$). Thus, both of these scales were used as predictors in this exploratory question.

**Exploratory Question 3.** Bivariate correlations were conducted for variables obtained from the psychological report (i.e., number of DSM-IV-TR diagnoses on Axis I; number of reported stressors; and number of reported coping strategies). Results indicated that number of DSM-IV-TR Axis I diagnoses was significantly correlated with number of reported stressors ($r = .36, p < .05$), but not number of reported coping mechanisms ($r = .003, p = .986$). Further, number of reported stressors and coping mechanisms were not significantly correlated with each other, though there was a trend for a significant correlation ($r = .30, p = .07$). Thus, only the number of DSM-IV-TR Axis I diagnoses and number of reported coping mechanisms were used as predictors in this exploratory question. Number of Axis I diagnoses was chosen over number of reported stressors, as, conceptually, number of Axis I disorders is a stronger, and therefore more salient, indicator of distress, because to be given a diagnosis, reported stressors must be interfering with one’s functioning in at least one domain.
Multiple Regression Analyses

**Hypothesis 1:** The validity scales of the MMPI-2 (i.e., F, and L) will predict outcome in terms of % EWL. Percent excess weight lost at each post-operative time period was regressed on the T-score of scales F and L.

3 months: This hypothesis was not supported, as neither scale F ($\beta = .10, p = .45$) nor scale L ($\beta = -.70, p = .60$) significantly predicted %EWL at 3 months. The T-scores on scales F and L explained 1.6 % of the variance in this model, which does not represent a detectable effect size ($f^2 = .016$).

6 months: This hypothesis was not supported, as neither scale F ($\beta = .25, p = .07$) nor scale L ($\beta = -.09, p = .53$) significantly predicted %EWL at 6 months. The T-scores on scales F and L explained 7.1 % of the variance in this model, which is consistent with a small effect size ($f^2 = .076$).

1 year: This hypothesis was not supported, as neither scale F ($\beta = .32, p = .12$) nor scale L ($\beta = -.05, p = .81$) significantly predicted %EWL at 1 year. The T-scores on scales F and L explained 9.6 % of the variance in this model, which is consistent with a small effect size ($f^2 = .106$).

**Exploratory Question 1:** Will scale 3 (Hysteria) and the negative treatment indicator TRT2 (Inability to Disclose) of the MMPI-2 predict outcome in terms of % EWL? Percent excess weight lost at each post-operative time period was regressed on the T-score of scale 3 and TRT2.

3 months: This hypothesis was not supported, as neither the T-score on scale 3 ($\beta = -.003, p = .98$) nor TRT2 ($\beta = .13, p = .33$) significantly predicted %EWL at
3 months. The $T$-scores on scales 3 and TRT2 explained 1.7% of the variance in this model, which does not represent a detectable effect size ($f^2 = .017$).

**6 months:** This hypothesis was not supported, as neither the $T$-score on scale 3 ($\beta = .05, p = .71$) nor TRT2 ($\beta = .09, p = .51$) significantly predicted %EWL at 6 months. The $T$-scores on scales 3 and TRT2 explained 1.3% of the variance in this model, which does not represent a detectable effect size ($f^2 = .013$).

**1 year:** This hypothesis was not supported, as neither the $T$-score on scale 3 ($\beta = .21, p = .30$) nor TRT2 ($\beta = .27, p = .19$) significantly predicted %EWL at 1 year. The $T$-scores on scales 3 and TRT2 explained 8.8% of the variance in this model, which is consistent with a small effect size ($f^2 = .096$).

**Exploratory Question 2:** Will subscales of scale 4 (Pd) of the MMPI-2, specifically, the Harris-Lingoes subscales (Harris & Lingoes, 1955, 1968) Pd1: Familial Discord and Pd2: Authority Problems, predict outcome in terms of % EWL? Percent excess weight lost at each post-operative time period was regressed on the $T$-score of subscales Pd1 and Pd2.

**3 months:** This hypothesis was not supported, as neither the $T$-score on scale Pd1 ($\beta = -.06, p = .64$) nor Pd2 ($\beta = -.21, p = .12$) significantly predicted %EWL at 3 months. The $T$-scores on Pd1 and Pd2 explained 5.5% of the variance in this model, which is consistent with a small effect size ($f^2 = .058$).

**6 months:** This hypothesis was partially supported, as the $T$-score on scale Pd2 ($\beta = -.28, p < .05$) significantly predicted %EWL at 6 months, but the $T$-score of scale Pd1 was not a significant predictor at 6 months ($\beta = .14, p = .30$). The $T$-scores on
Pd1 and Pd2 explained 8.5% of the variance in this model, which is consistent with a small effect size ($f^2 = .093$; see Table 10).

1 year: This hypothesis was not supported, as neither the $T$-score on scale Pd1 ($\beta = -.04, p = .85$) nor Pd2 ($\beta = .006, p = .98$) significantly predicted %EWL at 1 year. The $T$-scores on Pd1 and Pd2 explained 0.2% of the variance in this model, which does not represent a detectable effect size ($f^2 = .002$).

**Exploratory Question 3:** Will variables described in the psychological evaluation report (i.e., number of DSM-IV-TR Axis I diagnoses and number of self-reported coping mechanisms) predict outcome in terms of %EWL? Percent excess weight lost at each post-operative time period was regressed on the number of DSM-IV-TR Axis I diagnoses and the number of self-reported coping mechanisms.

3 months: This hypothesis was not supported, as neither the number of Axis I diagnoses ($\beta = .14, p = .36$) nor the number of coping mechanisms ($\beta = .05, p = .73$) significantly predicted %EWL at 3 months. The number of diagnoses and self-reported coping mechanisms explained 2.1% of the variance in this model, which is consistent with a small effect size ($f^2 = .021$).

6 months: This hypothesis was not supported, as neither the number of Axis I diagnoses ($\beta = .21, p = .19$) nor the number of coping mechanisms ($\beta = .02, p = .90$) significantly predicted %EWL at 6 months. The number of diagnoses and self-reported coping mechanisms explained 4.5% of the variance in this model, which is consistent with a small effect size ($f^2 = .047$).

1 year: This hypothesis was not supported, as neither the number of Axis I diagnoses ($\beta = -.16, p = .45$) nor the number of coping mechanisms ($\beta = .39, p = .08$)
significantly predicted %EWL at 1 year. The number of diagnoses and self-reported coping mechanisms explained 16.5% of the variance in this model, which is consistent with a medium effect size ($f^2 = .198$).

**Exploratory Question 4:** Will variables examined in the Hypotheses and prior Exploratory Questions predict outcome in terms of change in %EWL from one to two years post-surgery (i.e., maintenance of weight loss)? Change in %EWL between 1 and 2 years post-surgery was regressed on the predictors described in each hypothesis and exploratory question separately, in order to determine whether maintenance of weight loss in the long term could be predicted by the previously hypothesized predictor variables.

**Prediction 1:** The validity scales of the MMPI-2 (i.e., F and L) will predict outcome in terms of weight maintenance from one year to two years post-surgery, such that a higher T-score on scales F and L will be associated with more weight regain. This prediction was not supported, as neither scale F ($\beta = .008, p = .99$) nor scale L ($\beta = .45, p = .29$) significantly predicted maintenance of weight loss. The T-scores on scales F and L explained 20.1% of the variance in this model, which is consistent with a medium effect size ($f^2 = .252$).

**Inquiry 1:** Will scale 3 (Hysteria) and the negative treatment indicator TRT2 (Inability to Disclose) of the MMPI-2 predict outcome in terms of weight maintenance from one year to two years post-surgery? This inquiry was not supported, as neither the T-score on scale 3 ($\beta = .03, p = .94$) nor TRT2 ($\beta = .43, p = .26$) significantly predicted maintenance of weight loss. The T-scores on scales 3 and TRT2 explained
18.3% of the variance in this model, which is consistent with a medium effect size ($f^2 = .224$).

**Inquiry 2:** Will subscales of scale 4 (Pd) of the MMPI-2, specifically, the Harris-Lingoes subscales (Harris & Lingoes, 1955, 1968) Pd1: Familial Discord and Pd2: Authority Problems, predict outcome in terms of weight maintenance from one year to two years post-surgery? This inquiry was not supported, as neither the $T$-score on scale Pd1 ($\beta = .04, p = .92$) nor Pd2 ($\beta = .50, p = .22$) significantly predicted maintenance of weight loss. The $T$-scores on Pd1 and Pd2 explained 23.5% of the variance in this model, which is consistent with a medium effect size ($f^2 = .307$).

**Inquiry 3:** Will variables described in the psychological evaluation report (i.e., number of DSM-IV-TR Axis I diagnoses, and number of self-reported coping mechanisms) predict outcome in terms of weight maintenance from one year to two years post-surgery? This inquiry was not supported, as neither the number of Axis I diagnoses ($\beta = -.22, p = .64$) nor the number of coping mechanisms ($\beta = -.44, p = .38$) significantly predicted maintenance of weight loss. The number of diagnoses and self-reported coping mechanisms explained 30.8% of the variance in this model, which is consistent with a large effect size ($f^2 = .445$).

**Additional Analyses**

It should be noted that in addition to the planned analyses, independent $t$-tests were also conducted to examine group differences (i.e., using a mean split for %EWL) at three months, six months, and one-year post-surgery on specified MMPI-2 scales (i.e., F, L, Hy, Mf, Pa, Pd1, Pd2, TRT2), number of DSM-IV-TR Axis I diagnoses, and number of reported coping mechanisms. This was done in order to more specifically compare
results to Tsushima, Bridenstine, & Balfour’s (2004) study, which was similar to the current study. Results indicated that, consistent with Tsushima (2004), participants who lost a greater than average %EWL ($M = 47.5$, $SD = 6.84$) at one year scored significantly lower on the Pa (paranoia) scale than those that lost less than the average ($M = 53.15$, $SD = 6.96$; $t(25) = p < .05$). However, in contrast to Tsushima et al.’s results, participants in the higher %EWL group ($M = 53.57$, $SD = .8.45$) scored significantly higher on the F scale than those that lost less than the average ($M = 45.92$, $SD = 6.5$; $t(25) = 2.13$, $p < .05$). Individuals who lost a higher amount of %EWL ($M = 2.77$, $SD =1.79$) also reported a marginally significant higher number of coping mechanisms than individuals that lost less than the average %EWL ($M = 1.44$, $SD = .88$) at one-year post-surgery ($t(20) = 2.05$, $p = .054$). No significant differences were found at three or six months post-surgery.

In addition, results of $t$-tests conducted comparing the top and bottom 20% of participants in terms of %EWL at one-year with the same dependent variables also indicated that the only significant difference was found between groups on the Pa scale ($t(8) = 3.61$, $p < .01$), such that individuals in the top 20% of weight loss percentages ($M = 41.8$, $SD = 4.55$) scored significantly lower on the Pa scale than those in the bottom 20% of weight loss percentages ($M = 53.8$, $SD = 5.89$).
Chapter 5

Discussion

Bariatric, or weight loss, surgery has become more commonplace as a weight loss intervention for obese individuals with serious health complications such as Type II Diabetes or hypertension. According to the National Health and Nutrition Examination Survey (NHANES), the rate of obese adults has jumped from 15% in the 1976-1980 survey to 32.9% in the 2003-2004 survey (CDC, 2008). This increase in clinically significant weight problems has led to an increase in the number of individuals seeking this invasive weight control method. Bariatric surgery seekers are typically required to undergo a psychological evaluation; however, guidelines for conducting these evaluations vary and it is unclear what variables reliably predict success post-surgery. Thus, the objective of the current study was to determine whether specific psychological variables obtained during the psychological evaluation for gastric bypass surgery, specifically, validity and clinical scales of the MMPI-2 and the SCL-90-R, and psychosocial variables obtained during the clinical interview, could be used to predict success post-surgery in terms of percent excess weight lost (%EWL).

Overall, data analyses did not clearly identify which variables would reliably predict %EWL over time, aside from a lower score on scale Pd2 (Authority Problems) being a significant predictor of greater %EWL at 6 months. Although the percent of variance accounted for in each hypothesis increased over time, this may be a statistical
artifact as there was a diminishing number of participants over time, with only nine participants’ data available two-years post-surgery. However, several trends were noted. At three and six months post-surgery, a lower score on Scale Pd2 (Authority Problems) was associated with greater weight loss. Further, at six months post surgery, higher scores on scales F (Infrequency) and 2 (Depression), as well as a greater number of Axis I diagnoses tended to be associated with greater %EWL. In addition, at one and two years post-surgery, individuals with a greater number of reported coping mechanisms and higher scores on scale 1 (Hypochondriasis), respectively, were somewhat more likely to achieve greater weight loss outcomes.

Of the aforementioned trends, one in particular stands out as contradicting prior research. Specifically, the finding that a higher score on the F scale of the MMPI-2 was likely associated with greater weight loss is in contrast to Tsushima, Bridenstine, & Balfour (2004), whose results suggested that higher scores on the F scale were associated with lower percentages of weight lost. This difference may appear difficult to explain, as the two studies were so similar in conceptualization. However, there are several important differences in the demographics of participants in these studies. Most importantly, the current study did not include males, while Tsushima, Bridenstine, & Balfour’s study included both males and females. Males and females are likely to perceive and cope with distress in different manners; thus, it may be that gender is a moderator in the association between distress and weight loss.

Second, the ethnicity of participants in the current study were mainly European American or African American; the prior study conducted by Tsushima, Bridenstine, & Balfour (2004) did not specify the ethnicity of its participants. As the study appeared to
have been conducted in Hawaii, it is likely that the sample was made up of mainly European Americans, Asians, and Pacific Islanders, as these are the three most prevalent ethnicities found in Hawaii (The People of Hawaii, 2010). Thus, the difference between study results could also be due to cultural differences in weight loss after gastric bypass surgery, body image issues, and acceptance of obesity.

Despite the aforementioned differences between the current study and past research, the lack of solid significant findings in the current study may be due to the fact that individuals who did not attend follow-up appointments may have been less likely to follow post-surgical guidelines. Thus, this missing data may have been data that would more strongly support the hypotheses. This is suggested by the fact that non-adherent participants’ MMPI profiles were significantly different than adherent participants’ MMPI profiles on certain scales. Specifically, at three months, non-adherent participants showed a trend towards higher scores on scale Pd2 (Authority Problems), while at six months, non-adherent participants scored significantly higher on scales Pd2 and F (Infrequency). Participants who did not keep appointments at either one or two-years post-surgery did not demonstrate significantly different scores on any predictor variable than those who did keep the appointment. However, it must be noted that this could have been due to a lack of statistical power to detect this effect.

Thus, at least over the time interval covered by the present study, patients who held attitudes of hostility towards authority and experience a greater level of distress were less likely to attend follow-up appointments. These results are important in terms of identifying individuals in need of additional treatment or assessment prior to surgery. Although it was not possible to predict weight loss in these individuals, present results do
highlight an important issue in psychological evaluations for bariatric surgery: which individuals are more likely to be lost to follow-up. Thus, utilizing the F (Infrequency) and Pd2 (Authority Problems) scales could be useful in flagging individuals who may be at a higher risk for non-compliance post-surgery and thus, weight regain.

When present results are considered with prior research, it may be that individuals who score higher on the F scale are less likely to follow up, but those that choose to attend follow-up appointments, and report a greater number of coping mechanisms, get the assistance they needed for distress and thus are more resilient and lose more weight. This would indicate that individuals with higher scores on the F scale who do not follow-up, and are likely to utilize fewer coping skills, lose less weight. Further research is needed to better understand these findings.

In summary, the aim of PPS is to help identify challenges and strengths in order to assist a client in becoming as successful as possible in regards to surgical outcome. Present findings suggest that individuals experiencing a clinically elevated level of distress, specifically symptoms of depression in the absence of other significant psychopathology, may lose more weight post-surgery than their less-distressed counterparts. In addition, individuals who exhibit attitudes and behaviors that indicate a rejection of authority and run-ins with societal limits, may demonstrate worse outcomes in terms of %EWL. Thus, individuals experiencing a high level of distress or depression, but who are open to feedback from authority figures, should not be considered to be inappropriate for a procedure of this nature. Based on results of the current study, it appears that individuals experiencing more distress may use this distress as a motivator to adopt a lifestyle post-surgery that maintains weight loss. Present results suggest that,
although it may be difficult to definitively identify individuals who will demonstrate poor surgical outcomes, a higher score on scale Pd2 (Authority Problems) and lower scores on scales F (Infrequency) and 2 (Depression) may be utilized to identify individuals who would benefit from additional assistance or support or flag individuals at a higher risk of weight regain post-surgery. This means that individuals experiencing distress or depression should not be deemed poor candidates for surgery independent of further assessment results.

*Variables Associated with Weight Loss*

None of the predictor variables were individually significantly correlated with %EWL at any point in time post-surgery or weight maintenance. This indicates that, in the population studied, there was not one single robust predictor of weight loss or weight maintenance after having gastric bypass surgery. This was not unexpected, because for any presurgical psychological screen (PPS), the clinician must take into account many psychosocial factors to determine one’s likelihood of success after surgery.

In terms of variables from the MMPI-2, scores on the validity scales (i.e., F, L, K, and S) were expected to predict outcome in terms of % EWL such that higher T-scores on these scales would predict lower % EWL at follow-up. Individually, none of these scales were correlated with % EWL at any point post-surgery. In addition, all four of these scales could not be included in the analyses together due to the fact that scales K and S were significantly correlated with each other, and with scales F and L. This was likely due to the fact that scales K and S share 10 items and have been shown to be intercorrelated in the .80s in the restandardization sample of the MMPI-2 (Butcher & Han, 1995). Thus, K and S were taken out of the analyses to control for multicollinearity.
and increase the power in this model (i.e., to detect a medium effect size with power = .80, alpha set at .05, and a maximum of two predictors per hypothesis [instead of four], a total of at least 67 participants would be needed, instead of the initially calculated 84 participants; Cohen, 1992). L, K, and S are all measures of impression management, so it was not surprising that they were positively correlated. The F scale is a measure of distress, and was negatively correlated with the K and S scales; thus, it appears that as one’s distress increased, one’s ability to use impression management as a coping mechanism decreased. It makes intuitive sense that if an individual is experiencing a heightened state of distress and a lack of coping resources, one would not be able to optimally follow physician’s recommendations in losing weight appropriately after gastric bypass surgery. However, an individual’s score on the F and L scales was not proven to predict %EWL at 3 months, 6 months, and one year post-surgery, or weight maintenance from one-year to two-years post-surgery (i.e., the change score from one-year to two-years post-surgery).

There are several possible explanations for this hypothesis not being upheld. First and foremost, because of the lack of complete data available for this study, due to limited raw data available from the community mental health agency, the rate of follow-up declining over time, and not having many participants who were one or two years post-surgery, there may not have been enough power to detect this effect in this sample. Further evidence of this is seen in the correlations that approached significance, but did not reach an acceptable level of statistical significance, likely due to low power (i.e., not enough participants to demonstrate a medium effect at any time period measured in the study). As described above, the F scale on its own was positively correlated with %EWL.
at 6 months post-surgery and this association approached statistical significance. It should be noted that according to this finding, as a participant’s score on the F scale increased, he or she was likely to lose a greater amount of weight. This may be due to experiencing a greater motivation to change one’s behaviors as a result of experiencing more negative, distressing symptoms. This could be reflective, in part, of the psychological effects of obesity. Also, because only one previously identified study was examined to determine the predictive power of the MMPI-2 in this population, the estimation of a medium effect size may not be accurate.

Another reason for the lack of significant results regarding the predictive value of the validity scales of the MMPI-2 may have been that some clients seeking gastric bypass surgery were not as candid during the psychological evaluation as they were in appointments with their physician or surgeon. In other words, although the sample overall did not demonstrate clinically significant elevations on measures of impression management, some clients did score in the elevated range on these measures (i.e., scale L). The patients scoring at the high end of the range of scores for scale L may have tended to present themselves in a more favorable light in order to be approved for surgery by the psychologist, which may have restricted the range of scores on the F scale, which had been shown to predict weight loss at six months post-surgery. The experimenter’s own clinical experience suggests that many patients do not fully understand the rationale for the pre-surgical psychological evaluation and thus engage in some form of impression management, which may not happen in their interactions with physicians who deal with perceived physical, rather than psychological, issues. The slight impression management demonstrated during the psychological evaluation may have been unrelated to their
intentions towards and actions during post-surgery visits to the surgeon. Thus, for these individuals, their score in the normal range on the F scale may have been an underrepresentation of their actual distress; this interpretation is not, however, consistent with the finding that greater distress predicts greater weight loss.

In terms of variables from the SCL-90-R, global indices of distress were expected to be predictive of outcome in terms of % EWL such that higher T-scores on all three scales would predict lower % EWL. However, none of these indices (i.e., GSI, PST, PSDI) were individually correlated with weight maintenance or % EWL across time, and, in fact, none of the correlations between these variables even approached significance. Further, all three of these scales could not be utilized in one prediction model due to the fact that the Positive Symptom Total and Positive Symptom Distress Index were significantly correlated with each other and with the Global Severity Index. This is also not a surprising finding, as the calculations of these scores are quite similar (see Derogatis, 1994). Given these results, the SCL-90-R is likely not a good predictor of success in terms of weight loss or weight maintenance after having gastric bypass surgery. This measure is likely most effective in identifying individuals experiencing a significant amount of distress at the time of evaluation and may serve to assist the clinician in creating a psychological treatment plan; however, there is not support for the conclusion that individuals experiencing stress should not go forward with gastric bypass surgery. In fact, given that there is some support for the conclusion that the F scale of the MMPI-2, another robust measure of distress, is positively related to greater amounts of weight loss, it appears that current distress should not be used as an argument against
approval for gastric bypass surgery, as it may serve as a motivator for patients seeking surgery to adopt a lifestyle post-surgery that maintains weight loss.

More specific domains of distress (i.e., scales 1 (Hs), 2 (D), and 3 (Hy) and the negative treatment indicator subscales (TRT1: Low Motivation and TRT2: Inability to Disclose) of the MMPI-2) were expected to predict weight maintenance and % EWL at each follow up appointment such that higher scores on these scales predicted less weight lost and maintained over time. However, again, all five variables were unable to be entered into the same analysis, as there was significant multicollinearity. Specifically, scales 1 and 2 were significantly positively correlated with each other, with scale 3, and with the TRT scales, such that as T-score on one scale increased, so did the others. The TRT scales were significantly positively correlated with each other as well. It was decided that TRT2 (Inability to Disclose) was the most appropriate treatment indicator to examine in the analyses, as an inability to disclose could prevent an individual from obtaining the help they desire. Scale 3 was also entered as it was the only clinical scale not statistically related to TRT2 and it shared variance with scales 1 and 2. However, neither scale 3 nor TRT2 were significant predictors of weight maintenance or weight loss at any time measured. Again, this finding could be due to insufficient power to detect an effect or an inaccurate effect size measurement in previous literature. Specifically, as in previous hypotheses, several of the correlations between individual variables approached significance, such as between scale 1 and %EWL at two years post-surgery ($r = .61, p = .06$) and scale 2 and %EWL at 6 months post-surgery ($r = .26, p = .07$). These relationships could be consistent with the hypothesis that a higher level of
distress, specifically, symptoms of depression in the absence of other psychopathology, may predict better outcomes.

Measures of a rejection of social norms (i.e., subscales of scale 4 (Pd) of the MMPI-2, specifically, the Harris-Lingoes subscales (Harris & Lingoes, 1955, 1968) Pd1: Familial Discord and Pd2: Authority Problems) were expected to predict weight loss and maintenance such that higher scores on these scales would predict poorer outcomes. Bivariate correlations revealed that the Pd scales were not significantly related to each other and thus, measured reliably different constructs. Although familial discord (Pd1) was not a significant predictor of %EWL at any time (i.e., weight loss or weight maintenance) and authority problems (Pd2) was not a significant predictor of weight maintenance or % EWL at 3 months or one-year post-surgery, authority problems (Pd2) was demonstrated to be a significant predictor of % EWL at 6 months post-surgery. In addition, the association between Pd2 and %EWL at 3 months and 6 months post-surgery approached significance as well. This lends support to a central hypothesis of this study, which is that as an individual has more problems with authority (i.e., manifestations of attitudes and behaviors that indicate a rejection of authority and run-ins with societal limits), they will lose less weight, most likely due to the fact that they are unable or unwilling to follow guidelines posed by authority figures (i.e., the surgeon, nurse, or psychologist). The next logical question is what should be done for clients who demonstrate clinical elevations on this scale? Would high scores on this scale make them poor candidates for surgery and/or should they be denied surgery? The present finding is not strong enough to warrant this conclusion. Clinical evaluations and judgments, for bariatric surgery and otherwise, should not be made based on one isolated observation.
However, elevations on this scale may identify patients in need of more specific treatment planning and closer monitoring in order to increase their chances of success. Clinicians could further evaluate these patients’ attitudes and beliefs about authority figures based on past experiences, in order to identify approaches to overcome negative attitudes. This could include a focused cognitive behavioral course of treatment to challenge negative automatic thoughts; psychoeducation to improve a patient’s understanding of the difficulties of behavior change of this magnitude; and participation in a bariatric support group in order to make use of examples of the problems and successes that others have experienced.

Other psychosocial variables obtained during the clinical interview were also examined in terms of their usefulness in predicting surgical outcomes and preparing treatment plans. Specifically, number of Axis I and II diagnoses, number of self-reported stressors, and number of self-reported coping mechanisms were expected to predict %EWL such that higher %EWL would be predicted by lower number of diagnoses, lower number of stressors, and higher number of coping mechanisms. Because none of the participants were diagnosed with an Axis II disorder, and the number of stressors was significantly positively correlated with number of Axis I disorders, only number of coping mechanisms and number of Axis I disorders (which was determined to be the most robust measure of the degree to which stress is interfering with one’s functioning) were used to predict %EWL. In this sample, neither number of Axis I diagnoses nor number of self-reported coping mechanisms were significant predictors of weight loss or weight maintenance. However, the association between number of Axis I diagnoses and %EWL at 6 months post-surgery; and number of coping mechanisms and %EWL at one-
year post-surgery demonstrated a trend towards significance, which again may lend support to the notion that a higher level of distress, as well as more self-identified coping mechanisms, is associated with a greater amount of weight loss, particularly when the distress is great enough to result in a diagnosable mental health disorder.

Although there seems to be a trend in the data regarding psychosocial factors, this hypothesis may not have been fully examined due to variability in the written psychological reports reviewed for this study. Specifically, the number of self-reported stressors and self-reported coping mechanisms were not described in all participants’ psychological reports. Thus, this variable was only examined for individuals who had clearly verbally reported these variables to the clinician, as evidenced in the written evaluation (e.g., “The patient reported that her current stressors include a recent divorce and financial difficulties.”). Although specific stressors or coping mechanisms might have been extrapolated from some reports, this was not done due to the degree of subjective judgment required to identify both perceived stressors and coping mechanisms.

*Typical Psychological Profile of This Sample of Obese Individuals Seeking Bariatric Surgery*

In terms of psychological functioning, the typical profile of the study group on both the MMPI-2 and SCL-90-R was in the normal range. However, 84% of participants demonstrated clinical elevations on one or more clinical or validity scale of the MMPI-2, and 50% of participants who had completed the SCL-90-R demonstrated clinical elevations on one or more of the clinical or global index of distress scales. This pattern has also been identified in previous studies (Stunkard, Stinnet, & Smoller, 1986; van
The lack of severe patterns of psychopathology lends support to the notion that obese individuals, including those seeking surgery, do not display more distress or psychopathology than the average individual overall, in contrast to prior research findings. However, because prior research findings are robust, it may be that the individuals in the present study were psychologically healthier, as well as physiologically healthier based on pre-surgical BMI, than the average obese individual seeking surgery, indicating a restricted range problem in the current study. Further, all participants who attended follow-up appointments at one-year post-surgery had lost at least 50% of their excess weight, which is considered to be successful by some standards; thus, it was difficult to compare the current study findings to prior studies that compared MMPI-2 scores in “successful” versus “non-successful” groups based on a cut-off of 50% EWL (i.e., Tsushima, Bridenstine, & Balfour, 2004).

Limitations

The main limitation of this study was the small sample size. The power analysis indicated that at least 84 participants would be needed to detect the anticipated medium effects. However, of 111 potential participants, only 63 participants’ data was usable. This was due to several factors. First and foremost, 40 participants who were assessed at the mental health clinic did not have raw data (i.e., for the MMPI-2) available in their clinical files. This was an unforeseen limitation, and one that unfortunately could not be resolved.

In addition to the unobtainable data, several participants’ data was not used. Only two males were present in the usable dataset; thus, their data were eliminated in order to
prevent their data from skewing the dataset. Additionally, four females (eight of the 111 potential participants) became pregnant in the two-year span post-surgery. Because pregnancy significantly impacts weight, these females’ data were eliminated from the study as well.

Further, due to the variability in time since surgery, the number of possible data points varied. Specifically, 63 participants were more than 3 months post-surgery; 61 participants were more than 6 months post-surgery; 47 participants were more than one year post-surgery; and 21 participants were more than two years post-surgery. Further reduction of data occurred, as not all participants attended all of their possible follow-up appointments. In fact, at 3 months post-surgery, 95% of patients presented for their follow-up appointment, while only 85% presented for their 6 month follow-up. At one year post-surgery, 55% of patients presented for their follow-up appointment, and at two years post-surgery, only 43% presented for their appointments. Thus, as time passed, patients became much less likely to continue with follow-up appointments. Long-term follow-up is, arguably, just as important as short-term follow-up in order to ensure that the patient maintains weight loss. More specifically, weight loss may be more difficult to maintain as patients are no longer reinforced by small successes (e.g., decreasing numbers on the scale, fitting into smaller size clothing, etc.). Thus, it is extremely important for all patients to continue following up with their physicians.

Further, in this sample, the pattern of weight loss is unknown for a longer term follow-up period. Thus, there appears to be two distinct follow-up periods: one-year post-surgery, when weight loss is the expectation and greater than one year post-surgery, when the expectation is weight maintenance.
Finally, it should be noted that because numerous analyses were conducted for the current study, the few statistically significant results, or trends in that direction, could be due to chance alone.

Directions for Future Research

Present results suggest that individuals experiencing a greater amount of distress, specifically depressive symptoms in the absence of other significant psychopathology, may actually be more successful in weight loss efforts after having gastric bypass surgery than their less-distressed counterparts. In addition, there is some support for the hypothesis that individuals who exhibit problems with authority figures will be less successful. Because the current study’s hypotheses and research questions could not be definitively answered based on the obtained data, the significant findings should be followed up by replicating this study in a more comprehensive medical setting, for example, a Veteran’s Affairs (VA) Hospital, in which patients receive the majority of their medical care in the same building and the hospital utilizes an electronic medical record. With this modification to the study, the researcher would be able to obtain post-surgery weight measurements across time, regardless of whether the patient followed through specifically with their bariatric surgeon. In addition, if patients have a psychiatric history, it would likely be obtainable through the electronic medical record. This would allow for more solid diagnoses on Axis I and Axis II due to having more information, and could illuminate the effect of Axis II diagnoses on weight loss, as diagnoses on Axis II often indicate more rigid styles of thinking that the individual may be less willing or able to modify. Thus, a more complete dataset could be obtained in
order to determine whether the hypotheses are confirmed when the data obtained is not biased by patients’ inability or unwillingness to follow-up with their bariatric surgeon.

More research into utilizing the MMPI-2 in the psychological evaluation of individuals seeking bariatric surgery is recommended, as other, more specific, measures (e.g., BDI [Beck, Steer, & Brown 1996]; Impact of Weight on Quality of Life – Lite [IWQOL-Lite; Kolotkin, Crosby, Kosloski, & Williams, 2001]; and Short-Form-36 [SF-36; Ware, Snow, Kosinski, & Gandek, 1993]) have not demonstrated the ability to reliably predict change in weight over time (Lauzon, 2007). However, another modification to the current study would be to conduct a prospective study in which patients are administered a measure of social desirability, as another way to measure their approach to the evaluation, or resiliency. Distress may be measured in other ways as well. For instance, self-report measures are inherently biased because participants may respond in a way that they believe meets the evaluator’s expectations. Thus, a more objective measure of distress may be useful, such as a semi-structured clinical interview. Further, although general distress may be one predictor of outcome, in a bariatric surgery-seeking population, it may be more beneficial to evaluate distress level using a more comprehensive, health-related measure of distress. For example, the Millon Behavioral Health Inventory (MBHI; Millon, Green, & Meagher, 1982), is a 150 item true/false scale that assesses relevant personality factors and attitudes in medical, instead of psychiatric, patients (Rustad, 1985). By utilizing such additional measures, presurgical psychological screenings may be made more precise in identifying which variables predict outcome in order to determine which domains should be targeted for intervention either pre- or post-surgery.
The primary aim of the current study was to determine whether post-surgical “success,” in terms of %EWL, could be predicted based on previously obtained variables. Although weight loss is an important and intended result for bariatric surgery in the short-term (i.e., one to two years post-surgery), more research is needed to determine what variables predict longer term maintenance of weight loss and therefore, long-term health behaviors. In a surgery of this nature, which is intended to assist people who have experienced difficulty losing weight and are dealing with associated health risks, % EWL is a very basic change variable to examine to determine success, or outcome of surgery. However, “success” is a very general and subjective concept. For one person, success may mean losing all of his or her excess weight, while for another individual it may be the ability to walk one mile, decrease one’s medications, or simply the ability to fit into clothing sold in retail stores. Many different aspects of quality of life may be enhanced by bariatric surgery; thus, defining success in terms of only the number of pounds lost probably loses valuable information about this population. Several studies have examined the changes in quality of life after bariatric surgery, but more research into what variables predict these changes (for e.g., Harrington, 2009) is necessary. Thus, again, further research needs to include a systematic review of the variables examined during the presurgical psychological screen in order to determine with more certainty, what qualities predict a “successful” outcome after bariatric surgery.

Conclusion

Overall, analyses indicated that several variables obtained from the psychological evaluation show promise as predictors of short-term weight loss. Specifically, a higher $T$-score on the F (Infrequency), Hypochondriasis (Scale 1), and Depression Scales (Scale
2) of the MMPI-2, a greater number of Axis I diagnoses, a greater number of self-reported coping mechanisms, and a lower $T$-score on the Authority Problems subscale (Scale Pd2), were marginally significant predictors of better outcomes in terms of greater % EWL after bariatric surgery. However, the only variable demonstrated to statistically significantly predict outcome at 6 months post-surgery was a lower $T$-score on the Pd2 subscale. Thus, although the MMPI-2 may be a useful tool in psychological evaluations for bariatric surgery, further research needs to be conducted with a diverse sample of both males and females, in a more comprehensive medical setting and using additional psychosocial measures/variables in order to determine which variables consistently predict outcomes after bariatric surgery.
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<tr>
<td>4</td>
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<td>1.6</td>
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<td>Diagnosis</td>
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<td>Percent</td>
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<td>Remission</td>
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*Note.* Because several participants were diagnosed with more than one disorder, percentages do not add up to 100; NOS = Not Otherwise Specified.
Table 3  
*Means, Standard Deviations, and Ranges for T-Scores on the MMPI-2*

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<th>SD</th>
<th>Range</th>
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<td>Correction Scale (K)</td>
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<td>Superlative Self-Presentation Scale (S)</td>
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<td>10.10</td>
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<td><strong>Clinical Scales</strong></td>
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<td>Schizophrenia (Sc; 8)</td>
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<td>Mania (Ma; 9)</td>
<td>51.24</td>
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<td>Social Isolation (Si; 0)</td>
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<td>TRT1: Treatment Motivation</td>
<td>45.52</td>
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<td>TRT2: Inability to Disclose</td>
<td>47.10</td>
<td>10.89</td>
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Table 4  
Means, Standard Deviations, and Ranges for T-Scores on the SCL-90-R

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<td>53.86</td>
<td>12.50</td>
<td>13 - 80</td>
</tr>
<tr>
<td>Positive Symptom Distress Index (PSDI)</td>
<td>55.90</td>
<td>8.01</td>
<td>38 - 73</td>
</tr>
<tr>
<td>Predictor Variables</td>
<td>Adherence</td>
<td>Non Adherence</td>
<td>t(61)</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-----------</td>
<td>---------------</td>
<td>-------</td>
</tr>
<tr>
<td>F (Infrequency)</td>
<td>51.92</td>
<td>48.67</td>
<td>0.58</td>
</tr>
<tr>
<td>L (Lie)</td>
<td>57.18</td>
<td>53.33</td>
<td>0.59</td>
</tr>
<tr>
<td>3 (Hysteria)</td>
<td>60.90</td>
<td>61.33</td>
<td>-0.07</td>
</tr>
<tr>
<td>TRT2 (Inability to Disclose)</td>
<td>46.68</td>
<td>55.33</td>
<td>-1.35</td>
</tr>
<tr>
<td>Pd1 (Familial Discord)</td>
<td>50.70</td>
<td>48.00</td>
<td>0.55</td>
</tr>
<tr>
<td>Pd2 (Authority Problems)</td>
<td>57.08</td>
<td>69.00</td>
<td>-1.97</td>
</tr>
<tr>
<td>Number of Axis I Diagnoses</td>
<td>1.10</td>
<td>0.67</td>
<td>0.83</td>
</tr>
<tr>
<td>Number of Self-Reported Coping Mechanisms</td>
<td>2.28</td>
<td>1.00</td>
<td>1.28</td>
</tr>
</tbody>
</table>

Note. Adherent = patient attended follow-up appointment; Non-Adherent = patient was at least three months post-surgery, but did not attend follow-up appointment; CI = confidence interval; LL = lower limit; UL = upper limit; a degrees of freedom for number of reported coping mechanisms is 48 due to psychological report variability.
### Table 6
Adherent versus Non-Adherent Patients at Six Months Post-Surgery Follow-Up Appointment

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>Adherence</th>
<th>Non Adherence</th>
<th>95% CI</th>
<th>Cohen's d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>F (Infrequency)</td>
<td>50.17</td>
<td>8.27</td>
<td>59.56</td>
<td>12.52</td>
</tr>
<tr>
<td>L (Lie)</td>
<td>57.15</td>
<td>11.34</td>
<td>56.67</td>
<td>10.26</td>
</tr>
<tr>
<td>3 (Hysteria)</td>
<td>59.81</td>
<td>10.35</td>
<td>65.56</td>
<td>10.51</td>
</tr>
<tr>
<td>TRT2 (Inability to Disclose)</td>
<td>45.87</td>
<td>9.83</td>
<td>50.44</td>
<td>14.35</td>
</tr>
<tr>
<td>Pd1 (Familial Discord)</td>
<td>50.00</td>
<td>7.97</td>
<td>52.67</td>
<td>9.54</td>
</tr>
<tr>
<td>Pd2 (Authority Problems)</td>
<td>56.48</td>
<td>10.50</td>
<td>64.56</td>
<td>9.04</td>
</tr>
<tr>
<td>Number of Axis I Diagnoses</td>
<td>1.15</td>
<td>0.92</td>
<td>0.67</td>
<td>0.71</td>
</tr>
<tr>
<td>Number of Self-Reported Coping Mechanisms</td>
<td>2.28</td>
<td>1.81</td>
<td>2.00</td>
<td>1.20</td>
</tr>
</tbody>
</table>

*Note. Adherent = patient attended follow-up appointment; Non-Adherent = patient was at least six months post-surgery, but did not attend follow-up appointment; CI = confidence interval; LL = lower limit; UL = upper limit; a degrees of freedom for number of reported coping mechanisms is 46 due to psychological report variability; *p<.05; **p<.01.
## Table 7

### Adherent versus Non-Adherent Patients at One Year Post-Surgery Follow-Up Appointment

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>Adherence</th>
<th></th>
<th>Non</th>
<th></th>
<th></th>
<th></th>
<th>95% CI</th>
<th>Cohen's d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>t(45)</td>
<td>p</td>
<td>LL</td>
<td>UL</td>
</tr>
<tr>
<td>F (Infrequency)</td>
<td>49.69</td>
<td>8.49</td>
<td>50.76</td>
<td>8.54</td>
<td>-0.43</td>
<td>0.67</td>
<td>-6.10</td>
<td>3.96</td>
</tr>
<tr>
<td>L (Lie)</td>
<td>58.12</td>
<td>10.41</td>
<td>55.33</td>
<td>11.08</td>
<td>0.89</td>
<td>0.38</td>
<td>-3.55</td>
<td>9.11</td>
</tr>
<tr>
<td>3 (Hysteria)</td>
<td>61.38</td>
<td>11.82</td>
<td>58.67</td>
<td>9.05</td>
<td>0.87</td>
<td>0.39</td>
<td>-3.59</td>
<td>9.03</td>
</tr>
<tr>
<td>TRT2 (Inability to Disclose)</td>
<td>44.15</td>
<td>7.30</td>
<td>49.05</td>
<td>12.29</td>
<td>-1.61</td>
<td>0.12</td>
<td>-11.10</td>
<td>1.31</td>
</tr>
<tr>
<td>Pd1 (Familial Discord)</td>
<td>50.69</td>
<td>7.65</td>
<td>51.14</td>
<td>8.82</td>
<td>-0.19</td>
<td>0.85</td>
<td>-5.29</td>
<td>4.39</td>
</tr>
<tr>
<td>Pd2 (Authority Problems)</td>
<td>58.38</td>
<td>10.47</td>
<td>58.57</td>
<td>10.79</td>
<td>-0.06</td>
<td>0.95</td>
<td>-6.46</td>
<td>6.09</td>
</tr>
<tr>
<td>Number of Axis I Diagnoses</td>
<td>1.12</td>
<td>0.95</td>
<td>1.00</td>
<td>0.89</td>
<td>0.42</td>
<td>0.67</td>
<td>-0.43</td>
<td>0.66</td>
</tr>
<tr>
<td>Number of Self-Reported Coping Mechanisms</td>
<td>2.19</td>
<td>1.63</td>
<td>2.38</td>
<td>2.22</td>
<td>-0.29</td>
<td>0.77</td>
<td>-1.47</td>
<td>1.10</td>
</tr>
</tbody>
</table>

*Note.* Adherent = patient attended follow-up appointment; Non-Adherent = patient was at least one year post-surgery, but did not attend follow-up appointment; CI = confidence interval; LL = lower limit; UL = upper limit; \(^a\) degrees of freedom for number of reported coping mechanisms is 35 due to psychological report variability.
Table 8  
Adherent versus Non-Adherent Patients at Two Years Post-Surgery Follow-Up Appointment

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>Adherence</th>
<th>Non Adherence</th>
<th>t(19)</th>
<th>p</th>
<th>95% CI</th>
<th>Cohen's d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
<td>LL</td>
</tr>
<tr>
<td>F (Infrequency)</td>
<td>49.56</td>
<td>7.76</td>
<td>47.92</td>
<td>8.04</td>
<td>0.47</td>
<td>0.64</td>
</tr>
<tr>
<td>L (Lie)</td>
<td>57.89</td>
<td>11.32</td>
<td>58.75</td>
<td>6.82</td>
<td>-0.22</td>
<td>0.83</td>
</tr>
<tr>
<td>3 (Hysteria)</td>
<td>60.44</td>
<td>11.78</td>
<td>61.58</td>
<td>10.99</td>
<td>-0.23</td>
<td>0.82</td>
</tr>
<tr>
<td>TRT2 (Inability to Disclose)</td>
<td>41.44</td>
<td>5.55</td>
<td>46.25</td>
<td>9.76</td>
<td>-1.32</td>
<td>0.20</td>
</tr>
<tr>
<td>Pd1 (Familial Discord)</td>
<td>51.33</td>
<td>8.37</td>
<td>53.50</td>
<td>9.39</td>
<td>-0.55</td>
<td>0.59</td>
</tr>
<tr>
<td>Pd2 (Authority Problems)</td>
<td>51.67</td>
<td>8.28</td>
<td>57.83</td>
<td>11.79</td>
<td>-1.34</td>
<td>0.20</td>
</tr>
<tr>
<td>Number of Axis I Diagnoses</td>
<td>1.42</td>
<td>1.20</td>
<td>1.08</td>
<td>1.08</td>
<td>-1.24</td>
<td>0.23</td>
</tr>
<tr>
<td>Number of Self-Reported</td>
<td>1.78</td>
<td>1.20</td>
<td>1.78</td>
<td>1.20</td>
<td>0.58</td>
<td>0.58</td>
</tr>
</tbody>
</table>

Note. Adherent = patient attended follow-up appointment; Non-Adherent = patient was at least two years post-surgery, but did not attend follow-up appointment; CI = confidence interval; LL = lower limit; UL = upper limit; a degrees of freedom for number of reported coping mechanisms is 14 due to psychological report variability.
Table 9

*Bivariate Correlations of Weight Loss Post-Surgery*

<table>
<thead>
<tr>
<th>Time Post-Surgery</th>
<th>3 months $(n = 60)$</th>
<th>6 months $(n = 52)$</th>
<th>1 year $(n = 26)$</th>
<th>2 years $(n = 9)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 months</td>
<td>0.94***</td>
<td>0.73***</td>
<td>0.56</td>
<td></td>
</tr>
<tr>
<td>6 months</td>
<td></td>
<td>0.83***</td>
<td></td>
<td>0.65*</td>
</tr>
<tr>
<td>1 year</td>
<td></td>
<td></td>
<td>0.89**</td>
<td></td>
</tr>
<tr>
<td>2 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Weight loss is represented by percentage of excess weight lost; *p < .05, **p < .01, ***p < .001
Table 10
*Predictors of Percent Excess Weight Lost at Six Months Post-Surgery*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Percent Excess Weight Lost</th>
<th>B</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>72.25</td>
<td>[36.31, 108.19]</td>
<td></td>
</tr>
<tr>
<td>Pd1 (Familial Discord)</td>
<td>0.305</td>
<td>[-0.282, 0.892]</td>
<td></td>
</tr>
<tr>
<td>Pd2 (Authority Problems)</td>
<td>-0.462*</td>
<td>[-0.916, -0.007]</td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.085</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$F$</td>
<td>2.334</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. N = 52. CI = confidence interval. *$p < .05$.**
Figure 1  Determination of Usable Data

111 eligible to be in study

- 3 participants chose not to have surgery
- 39 participants did not have MMPI-2 raw scores in psychological medical record

69 participants with a complete data set

- 65 participants with usable data
  - 4 female participants that became pregnant
  - 2 males eliminated

63 participants with complete and usable data